**A Dissertation on**

# COMPARATIVE STUDY OF LATERAL INTERNAL SPHICTEROTOMY AND LATERAL INTERNAL SPHINCTEROTOMY WITH V-Y ADVANCEMENT FLAP IN TREATMENT OF CHRONIC ANAL FISSURE

*Submitted to*

*with partial fulfillment of the regulations for the award of*

**M.S. Degree in General Surgery**

**(Branch – I)**

**THE TAMILNADU**

**Dr.M.G.R. MEDICAL UNIVERSITY**

**CHENNAI - 600 032**

**APRIL 2016**

# CERTIFICATE

This is to certify that the dissertation titled **"COMPARATIVE STUDY OF LATERAL INTERNAL SPHINCTEROTOMY AND LATERAL INTERNAL SPHINCTEROTOMY WITH V-Y ADVANCEMENT FLAP IN TREATMENT OF CHRONIC ANAL FISSURE"** submitted to the Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the requirement for the award of M.S. Degree in General Surgery (Branch – I) is a Bonafide work done by **Dr.BALAMURUGAN.P,** A, post graduate student in General Surgery under my direct supervision and guidance during the period of july-2014 to august-2015.

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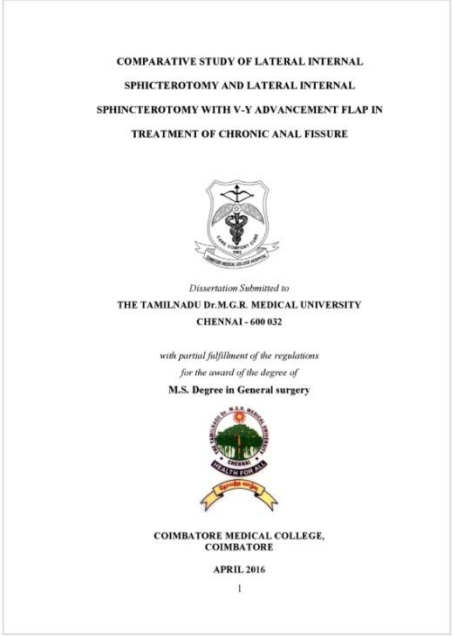

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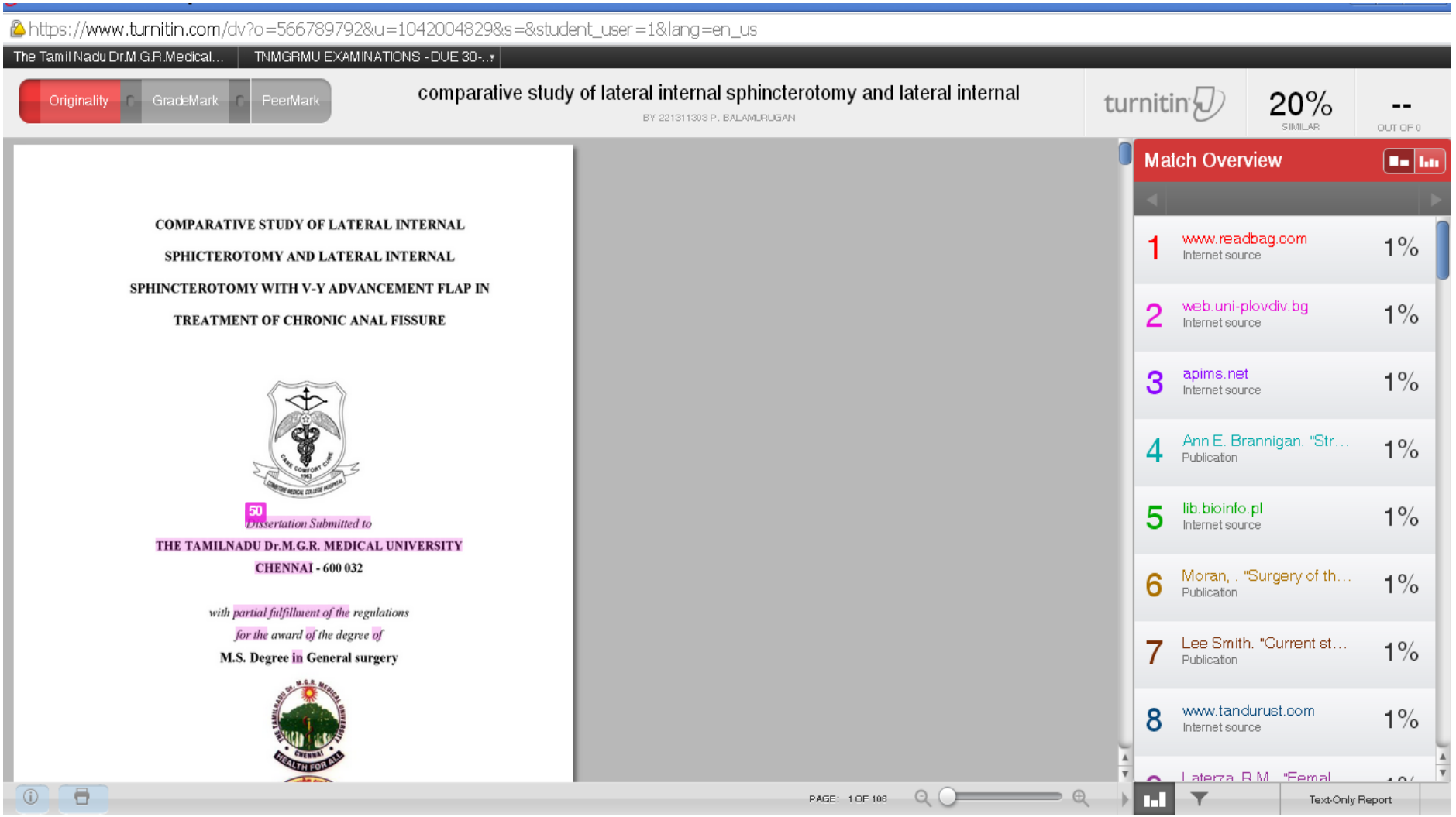
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# DECLARATION

I hereby declare that the dissertation entitled **"COMPARATIVE STUDY OF LATERAL INTERNAL SPHINCTEROTOMY AND LATERAL INTERNAL SPHINCTEROTOMY WITH V-Y ADVANCEMENT FLAP IN TREATMENT OF CHRONIC ANAL FISSURE"** was done by me at Coimbatore Medical College Hospital, Coimbatore -641018 during the period of my post graduate study for M.S. Degree in General Surgery (Branch – I) from 2014 to 2015.

This dissertation is submitted to the Dr. M.G.R. Medical University in partial fulfillment for the award of M.S., Degree in General Surgery (Branch – I). I have not submitted this dissertation on any previous occasion to any university for award of any degree.

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# INTRODUCTION

Anal fissure is a common problem that causes substantial morbidity in who are otherwise healthy. Anal fissure is an elongated ulcer in the long axis of lower anal canal .The most frequent site for anal fissure is midline posteriorly followed by midline anteriorly. The disease is more common in men while it is uncommon in children and elderly. It causes severe pain during defecation and rectal bleeding that stains the tissue or streaks the stools. The pathogenesis of chronic anal fissure remains incompletely understood but most are associated with a high resting anal pressure and reduced perfusion at the fissure site due to persistent hypertonia and spasm of the internal anal sphincter.

Chronic anal fissure has traditionally been treated by surgery, an effective and standard procedure that results in healing in 90-95% of the cases. A number of pharmacological sphincter relaxants have been introduced and claimed to show good results but surgical treatment is frequently needed. Lateral internal sphincterotomy heals chronic anal fissure in over 90% of cases but it is associated with potential long term complications. Incontinence to flatus and faecal soiling are distressing complications of sphincterotomy, some of them had delayed wound healing and recurrence of disease.

Anal advancement flaps were used to cover defect in perianal area and anal canal. This study was designed to study the hypothesis that chronic anal fissure unresponsive to conservative treatment may be regarded as unstable scar tissue. Using anal flaps to re-surface the chronic or recurrent anal fissure to promote the wound healing and assess the added advantage over the lateral internal sphincterotomy in terms of complete epithelization, time of relieve of pain, complications, persistent symptoms, patient stratification and recurrence, quality of life.

# AIMS OF THE STUDY

1. To compare the efficacy of lateral internal sphincterotomy against lateral internal sphincterotomy with V-Y advancement flap in treatment of chronic anal fissures

2. To compare the complications associated with procedures.

3. To assess the added advantages of V-Y advancement flap in treatment of chronic anal fissure in terms of wound healing, time of relief of pain, persistent symptoms and patients satisfaction.

4. To decide on the better treatment of chronic anal fissure based on the findings from the study.

# REVIEW OF LITERATURE

## Embryology of Anal Canal:

The distal one third of the transverse colon, descending colon, sigmoid, rectum and the upper part of the anal canal are derived from hindgut. Embryologically distal part of the surgical anal canal is not related to the hindgut. It most likely originates from ectodermal origin anal pit. The hindgut's terminal part enters into the posterior part of cloaca, the primitive anorectal canal and the allantois joins into the anterior part, the primitive urogenital sinus. The cloaca is an endodermal lined cavity covered by surface ectoderm ventrally. The cloacal membrane is formed by the boundary between endoderm and ectoderm(proctodeum).

The allantois and hindgut are separated by a layer of mesoderm and urorectal septum which is derived from the mesoderm covering the yolk sac and surrounding allantois. As the embryo grows and caudalfolding continues, the tip of the urorectal septum comes to lie close to the cloacal membrane, although the two structures never make contact. At the end of the seventh week, the cloacal membrane ruptures, creating the anal opening for the hindgut and a ventral opening for the urogenital sinus. Between the two, the tip of the urorectal septum forms the perineal body.

At the caudal most region of the anal canal closed by the proliferation of ectoderm. There canalization of this region occurs during ninth week. Hence the caudal part of anal canal is ectodermal in origin receiving its blood supply from inferior rectal arteries, branches of the internal pudendal arteries and cranial part is endodermal in origin and supplied by superior rectal artery which is a continuation of the inferior mesenteric artery which is the artery of the hindgut.[2,6]

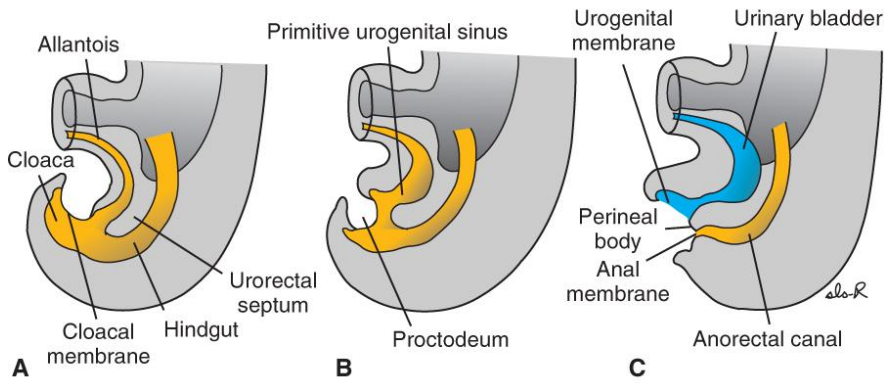



**Fig.1 Cloacal region in embryos at successive stages of development**

A. The hindgut enters the posterior portion of the cloaca, the future anorectal canal ; the allantois enters the anterior portion, the future urogenital sius.

B. As caudal folding of the embryo continues, the urorectal septum moves closer to the cloacal membrane.

C. Lengthening of the genital tubercle pulls the urogenital portion of the

cloaca anteriorly; breakdown of the cloacal membrane creates an opening for hindgut and one for the urogenital sinus. The tip of the urorectal septum forms the perineal body.

The pectinate line differentiate the junction between endodermal and ectodermal regions. The epithelium changes are seen at this line from columnar to stratified squamous epithelium

**Anatomy of the anal canal [1,7]:**

The terminal portion of the intestinal tract is anal canal. It begins at the anorectal junction (the point passing through the levator ani muscles), is about 4 cm long, passes downwards and backwards and terminates at the anal verge. This definition differs from that of the anatomist, who designates the anal canal as the part of the intestinal tract that extends from the dentate line to the anal verge. [11,12]

The anal canal is surrounded by strong muscles, and it is collapsed due to the tonic contraction of the muscles and represents an antero-posterior slit.

The musculature of the anorectal region may be regarded as two tubes, one surrounding the other.[13] The inner tube, being visceral, is smooth muscle and is innervated by the autonomic nervous system, while

the outer funnel-shaped tube is skeletal muscle and has somatic innervation. This short segment of the intestinal tract is of paramount importance because it is essential for the mechanism of fecal continence and also because it is prone to many diseases. The anatomy of the anal canal and perianal structures has been imaged using endoluminal magnetic resonance imaging [14]. The lateral canal is significantly longer than its anterior and posterior part.

The anterior external anal sphincter is shorter in women than in men and occupies30% and 38% of the anal canal length, respectively.

The median length and thickness of the female anterior external anal sphincter are 11and 13mm, respectively.

The caudal ends of the external anal sphincter forms a double layer. The perineal body is thicker in women than in men and easier to define.

The superficial transverse muscles have a lateral and caudal extension to the ischiopubic bones.

The bulbospongiosus is thicker in men than in women. The ischiocavernosus and anococcygeal body have the same dimensions in both sexes.

**Relations:**

Anal canal is posteriorly related to its surrounding muscle, anococcygeal ligament and the coccyx.

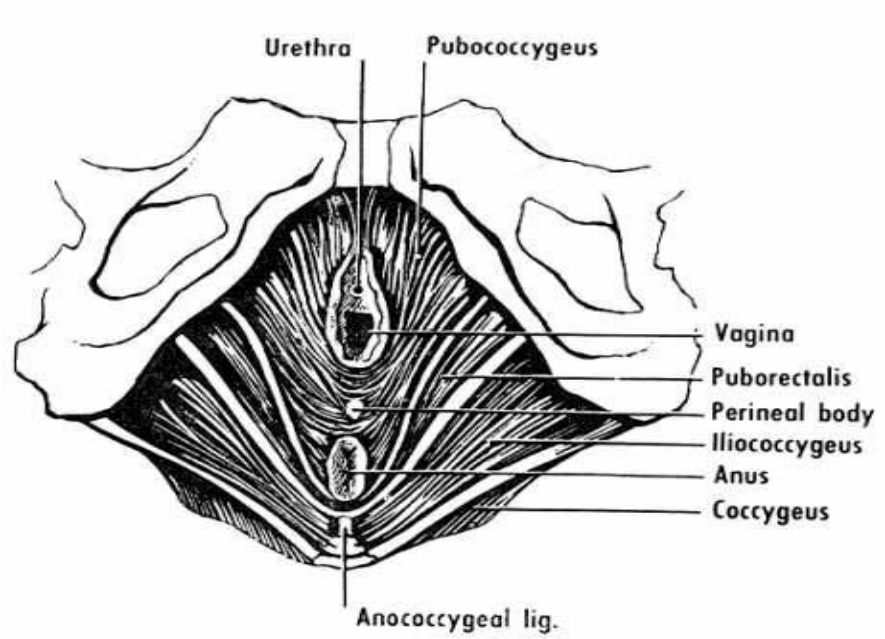



**FIG:2-Anatomical relations of anal canal**

Laterally anal canal is related to ischiorectal fossae with its inferior rectal vessels and nerves. In the male, anal canal is anteriorly related to urethra and in the female to perineal body and lowest part of the posterior vaginal wall [(9)].

## LINING OF THE ANAL CANAL

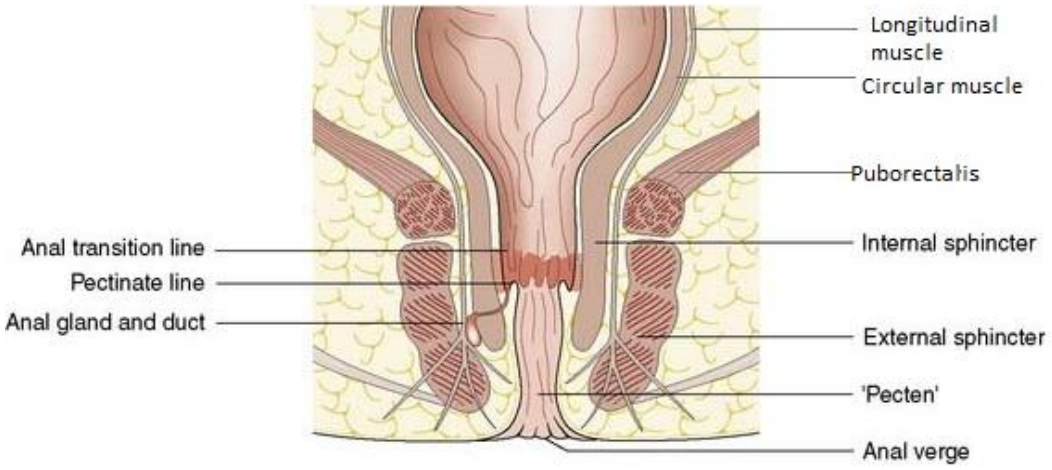



**Fig:3- Anal canal anatomy**

The anal canal can be divided into 3 parts and each part consists of epithelium of different types. At approximately the midpoint of the anal canal there is an undulating demarcation referred to as the dentate line. This line is approximately 2 cm from the anal verge. Because the rectum narrows into the anal canal, the tissue above the dentate line takes on a pleated appearance.

In the upper part of anal canal mucosa shows the longitudinal folds which are around 6 to 14 in number known as the Columns of Morgagni. There is a small pocket or crypt at the lower end of and between adjacent columns of the folds. These crypts are of surgical significance because foreign material may become lodged in them, obstructing the ducts of the anal glands and possibly resulting in sepsis.

The mucosa of the upper anal canal is lined by columnar epithelium. Below the dentate line the anal canal is lined with a squamous epithelium [3,9]. The part of anal canal in middle part of a distance of 6-12mm above the dentate line there is a gradual transition where columnar, transitional, or squamous epithelium may be found. This area, referred to as the anal transitional or cloacogenic zone, has extremely variable histology and anal column are absent in this part of anal canal

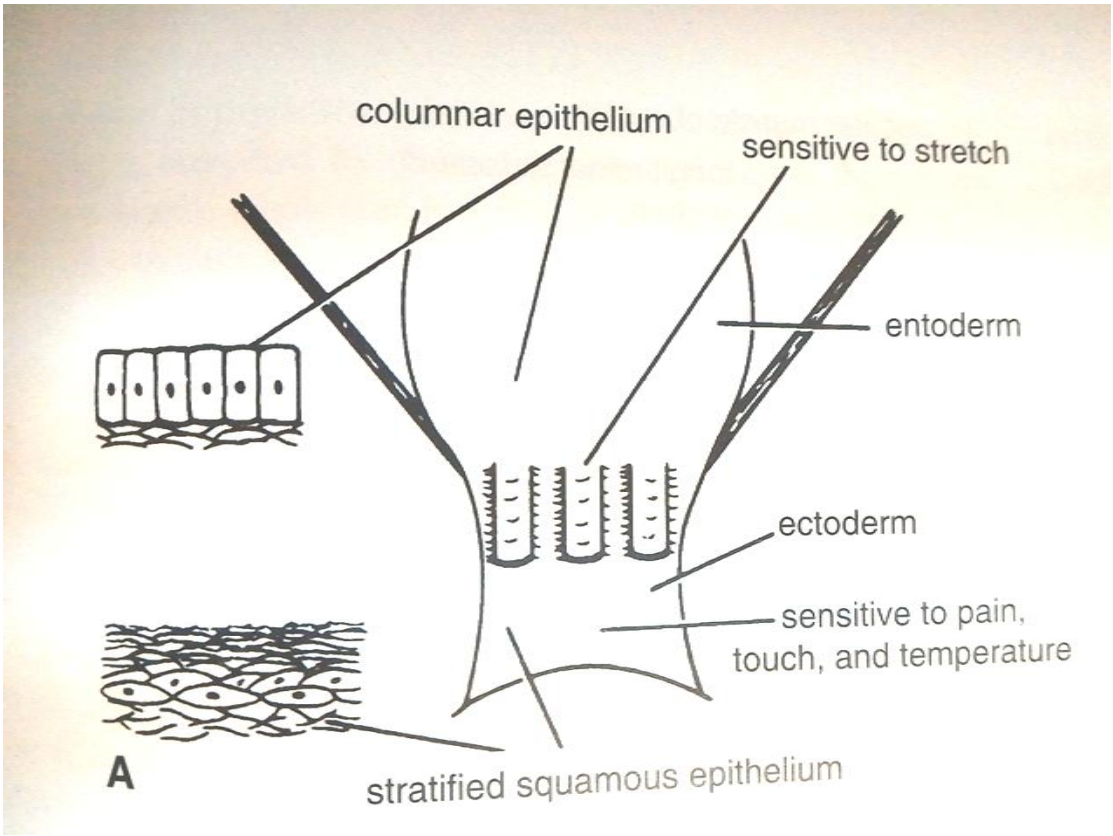



**Fig:4- Lining of anal canal**

A colour change in the epithelium is also noted. The rectal mucosa is pink, whereas the area just above the dentate line is deep purple or plum color due to the underlying internal haemorrhoidal plexus. Subepithelial tissue is loosely attached to and radially distensible from the internal haemorrhoidal plexus. Subepithelial tissue at the anal margin, which contains the external haemorrhoidal plexus, forms a lining that adheres firmly to the underlying tissue.

The lining is anchored by the mucosal suspensory ligament at just the dentate line [15]. The perianal space is limited above by this ligament and below by the attachment of the longitudinal muscle to the skin of the anal verge.

The area below the dentate line is not true skin because it is devoid of accessory skin structures (e.g., hair, sebaceous glands, and sweat glands). The area about approximately 1.5cm below dentate line is pale, delicate, smooth, thin, and shiny stretched tissue is referred to as anoderm. At the anal verge the lining becomes thicker and pigmented and acquires normal skin histological features like hair follicles, glands and others [1,16]. In this circumanal area there is also a well-marked ring of apocrine glands, which may be the source of the clinical condition called hidradenitis suppurativa. The epithelium proximal to dentate line is

innervated by the autonomic nervous system, while distal part of the lining is richly innervated by the somatic nervous system [17].

**ANALTRANSITIONAL ZONE**

The anal transitional zone (ATZ) is interposed between uninterrupted colorectal type mucosa (columnar) above and uninterrupted squamous epithelium (anoderm) below, irrespective of the type of epithelium present in the zone itself [18].

The ATZ usually commences just above the dentate line and is much smaller than commonly thought. The histology of the ATZ is extremely variable. Most of the zone is covered by ATZ epithelium ie., transitional epithelium similar to urothelium, which is composed of four to nine cell layers—the basal cells, columnar, cuboidal, polygonal or flat cells, unkeratinized squamous epithelium, and anal glands. The ATZ epithelium contains a mixture of sulphomucin and sialomucin. The mucin pattern in the columnar variant of the ATZ epithelium and in the anal canal is of the same type and differs from that of colorectal- type epithelium. Histochemical study shows that endocrine cells have been demonstrated in 87% of specimens. Their function is unknown. Melanin is found in the basal layer of the ATZ epithelium in 14% of specimens. Melanin cannot be demonstrated in the anal gland but is a constant

finding in the squamous epithelium below the dentate line, increasing in amount as the perianal skin is approached. The melanin containing cells in the ATZ seem a reasonable point of origin for melanoma, as do the findings of junctional activity and atypical melanocyte hyperplasia in the ATZ. The ATZ can be demonstrated macroscopically by taking whole mount staining by Alcian blue dye, which stains the mucosa similar to rectal showing light green or blue whereas squamous epithelium is unstained

**ANAL GLANDS**

The average number of glands present in a normal anal canal is six (range 3-10)[19]. Each gland is lined by stratified columnar epithelium with mucus-secreting or goblet cells interspersed within the glandular epithelial lining and has a direct opening into an anal crypt (Crypt of Morgagni) at the dentate line. Occasionally, two or more glands can open into a crypt. While half of the crypts have no communication with the glands.

These glands were first described by Chiari in 1878[20]. The importance of their role in the pathogenesis of fistulous abscess was presented by Parks in 1961[13].

Seow-Choen and Ho find that 80% of the anal glands are submucosal in extent and 8% extend to the internal sphincter, 8% to the conjoined longitudinal muscle, 2% to intersphincteric space, and 1% penetrate the external sphincter. The anal glands are fairly evenly distributed around the anal canal, although the greatest number are found at the anterior quadrant. Mild to moderate lymphocytic infiltration is noted around the anal glands and ducts; this is sometimes referred to as "anal tonsil."

**DENTATE LINE**

It is an important landmark both morphologically and surgically. It signifies of fusion of the proctodeum and the post allantoic gut. And also tells about the position of the anal membrane. The remants of this membrane may be present as anal papillae at the free margins of the anal valves. The dentate line differentiates two areas-

Upper:

- Lined by cubical epithelium
- Innervated by autonomic nerves (insensitive to pain)
- Has a supply from portal venous system

Lower:

- Lined by squamous epithelium
- Innervated by spinal nerves (sensitive to pain)
- Has a supply from systemic venous system

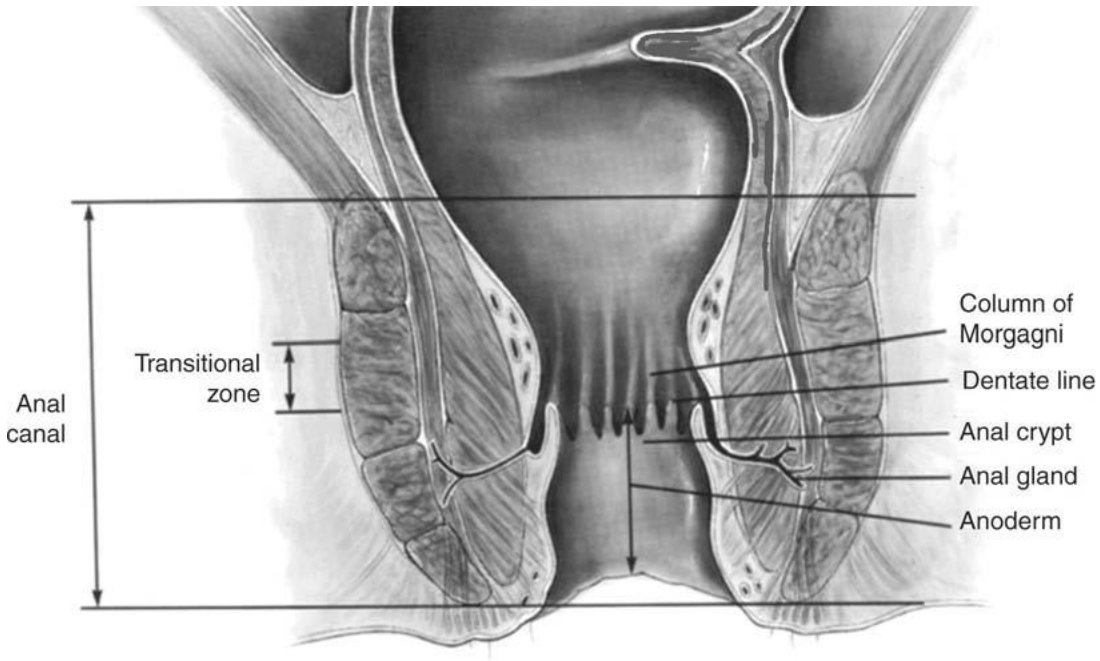



**Fig:5- Dentate line –Anatomy**

**ANATOMICALAND SURGICAL IMPORTANCE OF DENTATE LINE :**

1. It forms the embryological watershed between visceral structures above and somatic structures below the line.

2. The mucosa above the line has an autonomic nerve supply and hence is insensitive, whereas the skin below as a somatic nerve

supply supplied by the Inferior rectal branch of the Pudendal nerve and is pain sensitive.

3. The venous drainage of the mucosa above is into the Inferior mesenteric and portal circulation, whereas, of the skin below is into the systemic venous circulation.

4. Above the dentate line lymph drains into the Internal iliac nodes while below is into the Inguinal nodes.

## ANORECTAL SPACES

### PERIANAL SPACE[1,7,9]

The perianal space is the immediate area of the anal verge surrounds the analcanal. Morphologically it represents part of proctodaeum. Clinically it is the part of lower bowel here painful lesions occur.

Laterally it becomes continuous with the subcutaneous fat of the buttocks ormay be confined by the conjoined longitudinal muscle.

Medially it extends into the lower part of the anal canal as far as the dentate line. It is continuous with the intersphincteric space.

The perianal space contains the lowest part of the external sphincter, the external haemorrhoidal plexus, branches of the inferior rectal vessels, and lymphatics and fat.

The radiating elastic septa divide the space into a compact honeycomb arrangement, which accounts for the severe pain produced by a collection of pus or blood.

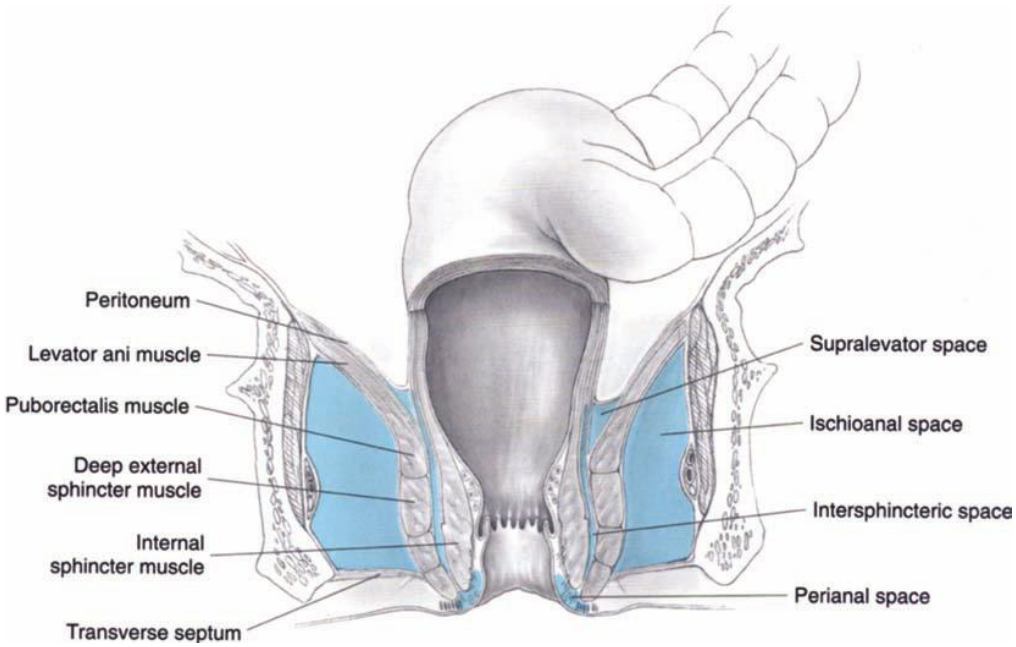



**Fig:6-Muscles of anal canal**

## ISCHIOANAL SPACE

The ischioanal fossa is a pyramid-shaped space situated on either side side of anal canal below pelvic diaphragm. The apex is formed where levator ani take its origin from obturator fascia and base is directed downwards towards skin on the perineum.

The anterior boundary of fossa is formed by the superficial and deep transverse perineal muscles and the posterior boundary of the perineal membrane. The posterior boundary of fossa is formed by the gluteal skin. The external sphincter muscles and levator ani form medical wall.

The obturator internus muscle with obturator fascia and ischium, form lateral wall

The base or inferior boundary is the transverse septum which divides this space from the perianal space[21].

In the obturator fascia on the lateral wall, is the Alcock's canal which contains the internal pudendal vessels and the pudendal nerve. When the ischioanal and perianal spaces are regarded as a single tissue space, it is called the Ischioanal fossa[22]. The contents of the ischioanal fossa consist of a pad of fat, the inferior rectal nerve coursing from the back of the ischioanal fossa forward and medially to the external sphincter, the inferior rectal vessels, portions of the scrotal nerves and vessels in men and the labial nerves and vessels in women, the transverse perineal vessels, and the perineal branch of the fourth sacral nerve running to the external sphincter from the posterior angle of the fossa [23].

Anteriorly the ischioanal space has an important extension forward, above the urogenital diaphragm, which may become filled with pus in cases of ischioanal abscesses.

**INTERSPHINCTER1C SPACE**

The intersphincteric space lies between the internal and external sphincter muscles and is continuous below with the perianal space and extends above into the wall of the rectum.

**SUPRALEVATOR SPACE**

Supralevator space situated on each side of the rectum. Supralevator space is bounded superiorly by the peritoneum, laterally by the pelvic wall, medially by the rectum and inferiorly by the levator ani muscle. Sepsis in this area may occur because of upward extension of anoglandular origin or from a pelvic origin.

**SUBMUCOUS SPACE**

Submucous space lies between the internal sphincter and the mucosa. It extends distally to the dentate line and proximally becomes continuous with the submucosa of the rectum. It contains the internal haemorrhoidal plexus. Although abscesses in this space have been described but they are probably of little clinical significance and have been mistaken for what in fact are intersphincteric abscesses.

## SUPERFICIAL POSTANAL SPACE

The superficial postanal space connects the perianal spaces with each other posteriorly below the anococcygeal ligament.

## DEEP POSTANAL SPACE

The right and left ischioanal spaces are continuous posteriorly above the anococcygeal ligament but below the levator ani muscle through the deep postanal space which can also be called Retrosphincteric space of Courtney. This postanal space is the usual pathway by which purulent infection spreads from one ischioanal space to the other, which results in the so-called horseshoe abscess.

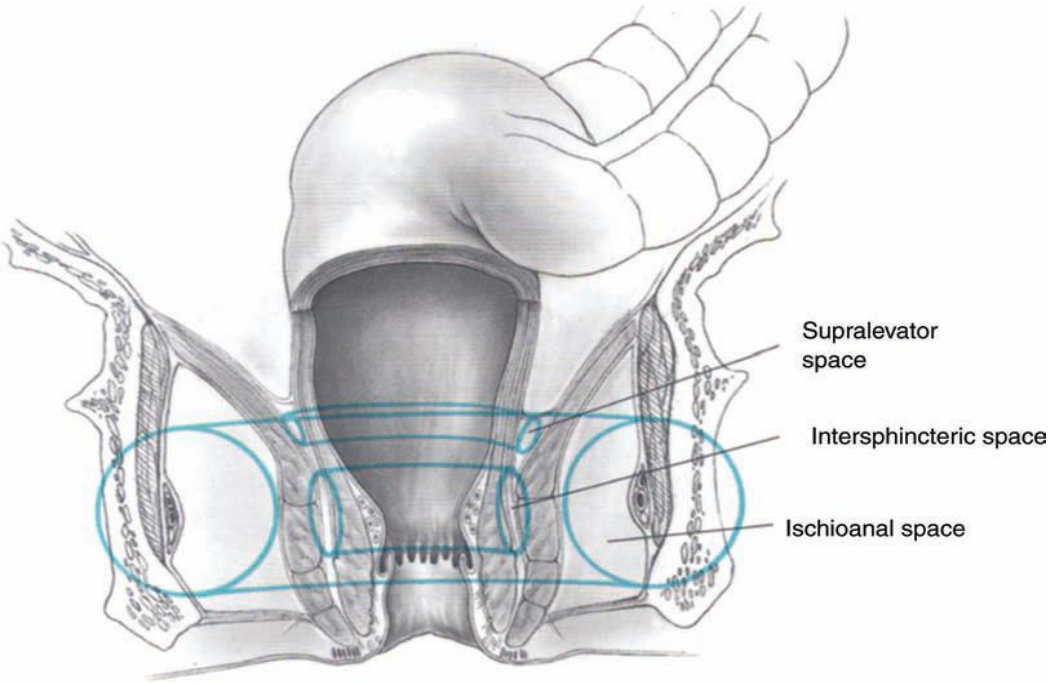



**Fig:7-Horseshoe abscess.**

## RETRORECTAL SPACE

The retrorectal space lies between the upper two-thirds of the rectum and sacrum above the rectosacral fascia. It is limited anteriorly by the fascia propria covering the rectum, posteriorly by the presacral fascia and laterally by the lateral ligaments (stalks) of the rectum. Superiorly it communicates with the retroperitoneal space and inferiorly it is limited by the rectosacral fascia which passes forward from the S4 vertebra to the rectum about 3-5cm proximal to the anorectal junction. Below the recto sacral fascia is the supralevator space, a horseshoe-shaped potential space, which is limited anteriorly by the fascia propria of the rectum and below by the levator ani muscle. The retrorectal space contains loose connective tissue. The presacral fascia protects the presacral vessels that lie deep to it. The presacral veins are part of the extensive vertebral plexus and are responsible for the major bleeding problems encountered in this area during operation. In addition to the usual tissues from which neoplasms arise, this is an area of embryologic fusion and remodeling and thus it is the site for persistence of embryologic remnants from which neoplasms also can arise[(9)].

The perianal, ischioanal, and supralevator spaces on each side connect posteriorly with their counterparts on the opposite side forming a horseshoe-shaped communication.

## MUSCLES OF THE ANORECTAL REGION

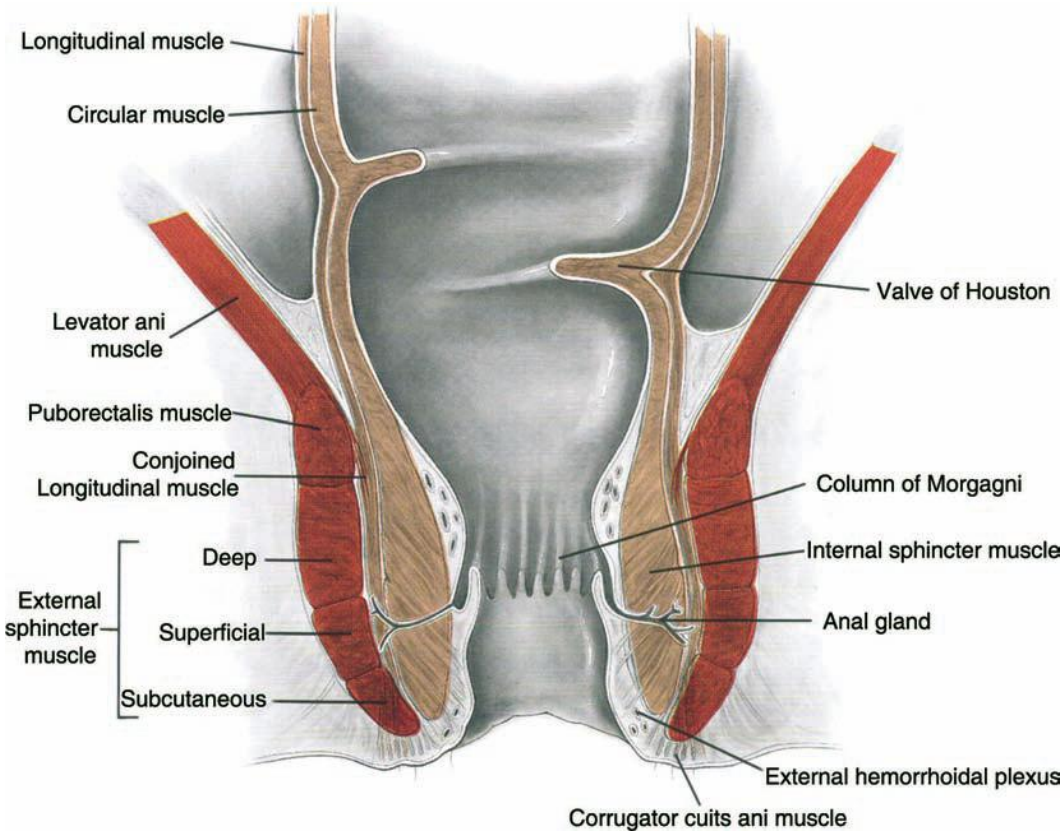



**Fig:8-Muscles of anorectal region**

## MUSCLES OF THE ANO RECTAL REGION[1,2,5,9]:

## INTERNAL SPHINCTER MUSCLE

The downward continuation of the circular, smooth muscle of the rectum becomes thickened and rounded at its lower end and is called the internal sphincter. Its lowest portion is just above the lowest part of the external sphincter and is 1-1.5 cm below the dentate line.

## CONJOINED LONGITUDINAL MUSCLE

At the level of the anorectal ring, the longitudinal muscle coat of the rectum is joined by fibers of the levator ani and puborectalis muscles. Another contributing source is the pelvic fascia[24]. The conjoined longitudinal muscle so formed descends between the internal and external anal sphincters. Many of these fibers traverse the lower portion of the external sphincter to gain insertion in the perianal skin and are referred to as the corrugator cutis ani[25]. Lunnis and Phillips[26] speculated that this muscle plays a role as a skeleton supporting and binding the internal and external sphincter complex together as an aid during defecation by everting the anus, as a support to the haemorrhoidal cushions, and as a determining factor in the ramification of sepsis.

## EXTERNAL SPHINCTER MUSCLE

This elliptical cylinder of skeletal muscle that surrounds the anal canal was originally described as consisting of three distinct divisions: the subcutaneous, superficial, and deep portions [27].

This account was shown to be invalid by Goligher. Who demonstrated that a sheet of muscle runs continuously upward with the puborectalis and levator ani muscles. The lowest portion of the external sphincter occupies a position below and slightly lateral to the internal

sphincter. A palpable groove at this level has been referred to as the inter sphincteric groove. The lowest part (subcutaneous fibers) is traversed by the conjoined longitudinal muscle, with some fibers gaining attachment to the skin. The next portion (superficial) is attached to the coccyx by a posterior extension of muscle fibers that combine with connective tissue, forming the anococcygeal ligament. Above this level the deep portion of the external sphincter is devoid of posterior attachment and proximally becomes continuous with the puborectalis muscle. Anteriorly, the high fibers of the external sphincter are inserted into the perineal body, where some merge and are continuous with the transverse perineal muscles. The female sphincter has a variable natural defect occurring along its anterior length[28].

The external sphincter is supplied by the inferior rectal nerve and a perineal branch of the fourth sacral nerve.

**PERINEAL BODY**

The perineal body is the anatomic location in the central portion of the perineum where the external sphincter, bulbocavernosus, and superficial and deep transverse perineal muscles meet. This tends to be a tendinous intersection and is believed to give support to the perineum and to separate the anus from the vagina.

## PELVIC FLOOR MUSCLES

The levator ani muscle is a broad, thin muscle that forms the greater part of the floor of the pelvic cavity and is innervated by the fourth sacral nerve. This muscle traditionally has been considered to consist of three muscles:

The iliococcygeus, the pubococcygeus, and the puborectalis.

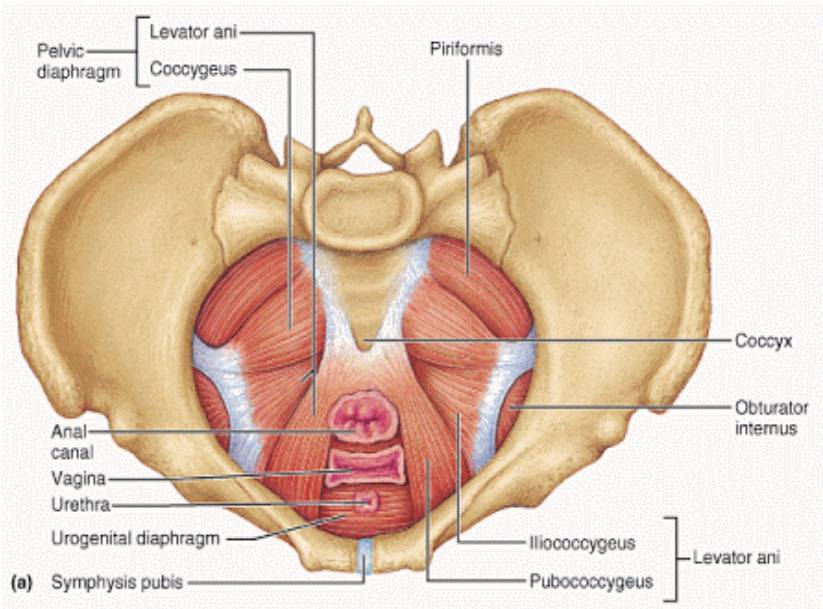



**Fig:9-Pelvic floor muscles**

**Puborectalis Muscle**

The puborectalis muscle arises from the back of the symphysis pubis and the superior fascia of the urogenital diaphragm and runs backward alongside the anorectal junction, and joins its fellow muscle of the other side immediately behind the rectum, where they form a U-shaped loop that slings the rectum to the pubes.

**Iliococcygeus Muscle**

The iliococcygeus muscle gets originated from ischial spine and posterior portion of the obturator fascia passes downward, backward, and medially, to getinserted on the last two segments of the sacrum, the coccyx, and the anococcygeal raphe. There are no connections to the anal canal [(24)].

**Pubococcygeus Muscle**

The pubococcygeus muscle arises from the anterior half of the Obturator fascia and the back of the pubis. Its fibers are directed backward, downward, and medially,where they decussate with fibers of the opposite side and this line of decussation is called the anococcygeal raphe [(25)].

Some fibers which lie more posteriorly are attached directly to the tip of the coccyx and the last segment of the sacrum. This muscle also sends fibers and help in the formation of the conjoined longitudinal muscle. The muscle fibers of the pubococcygeus form an elliptical space while proceeding backward downward and medially called the **"levator hiatus"** through which pass the lower part of the rectum and either the vagina and urethra in women or in men the prostatic urethra and dorsal vein of the penis. The intrahiatal viscera are bound together by part of the pelvic fascia, which is more condensed at the level of the anorectal junction and has been called the **"hiatal ligament"**[29]**.** This ligament is believed to keep the movement of the intrahiatal structures in harmony with the levator ani muscle. The crisscross arrangement of the anococcygeal raphe prevents the constrictor effect on the intrahiatal structures during levator ani contraction and causes a dilator effect. The puborectalis and the levator ani muscles have a reciprocal action. As one contracts, the other relaxes. During defecation there is puborectalis relaxation accompanied by levator ani contraction, which widens the hiatus and elevates the lower rectum and anal canal. When a person is in an upright position, the levator ani muscle supports the viscera.

## ANORECTAL RING

**"Anorectal ring"** is a term coined by Milligan and Morgan [27] to denote the functionally important ring of muscle that surrounds the junction of the rectum and the anal canal. It is composed of the upper borders of the internal sphincter and the puborectalis muscle. It is importance during the treatment of abscesses and fistulas because division of this ring will inevitably result in anal incontinence

## INNERVATION OF THE ANAL CANAL[1,2,9]

### A. MOTOR SUPPLY :

1) Internal anal sphincter:

It is innervated by both sympathetic and parasympathetic fibres. Sympathetic fibres arise from the *pelvic plexus* and cause contraction of the sphincter. Parasympathetic enter from the *pelvic splanchnic nerves (S 2,3,4)* and cause relaxation of the sphincter.

2) External anal sphincter:

It is supplied by the inferior rectal branch of the internal pudendal nerve and the perineal branch of the fourth sacral nerve.

The pudendal nerve passes through the greater sciatic foramen and crosses the sacrospinous ligament and is accompanied by the internal pudendal artery and vein. The pudendal nerve lies on the lateral wall of the ischioanal fossa, where it gives off the inferior rectal nerve, which crosses the ischioanal fossa with the inferior rectal vessels to reach the external sphincter.

**B. SENSORY SUPPLY :**

The region of the anal canal above the dentate line gets its sensory supply by autonomic nerves (S2,3) and hence is insensitive to pain. Below the dentate line it gets its supply by the Inferior Rectal nerve, a branch of the Pudendal nerve and is sensitive to pain. The epithelium of the anal canal is profusely innervated with sensory nerve endings more in the dentate line region.

**ARTERIAL SUPPLY OF ANAL CANAL**

The anal canal gets its supply by the branches from superior, middle and inferior rectal arteries.

1) Superior rectal artery:

The inferior mesenteric artery proceeds downward, crossing the left common iliac artery and vein till the base of the sigmoid mesocolon to become the superior rectal artery.

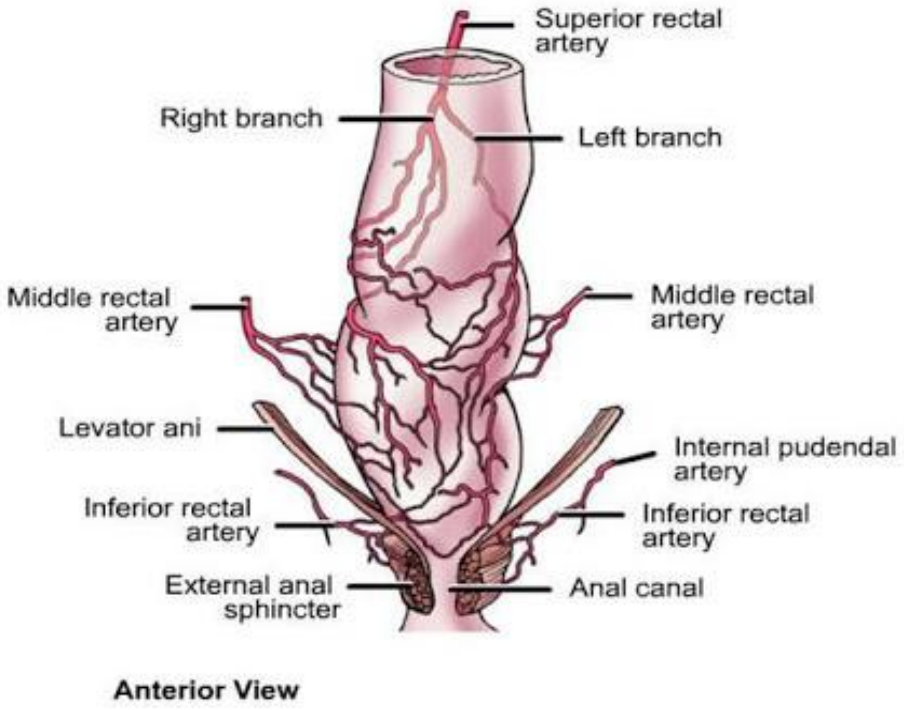



**Fig:10-Arterial supply of anal canal**

The superior rectal artery starts at the last branch of the sigmoid artery. It lies posteriorly to the right of the sigmoid colon, coming in close contact with the posterior aspect of the bowel at the rectosigmoid junction. It forms a rectosigmoid branch, an upper rectal branch and then divides into left and right terminal branches. The terminal branches extend downward and forward around the lower two thirds of the rectum till the level of the levator ani muscle.

Tortuous small branches ascend subperitoneally in the anterior aspect of the upper third of the rectum and anastomose with the upper rectal branch.

The rectosigmoid branch arises at the rectosigmoid junction and divides directly into two diverging branches. One ascends to the sigmoid colon and anastomoses with branches of the last sigmoid artery and the other descends to the rectum and anastomoses with the upper rectal branch.

The upper rectal branch arises from the superior rectal artery before its bifurcation. It makes an extramural anastomosis with the lower branch of the rectosigmoid artery and the terminal branch of the superior rectal artery [30].

2) Middle rectal artery:

Middle rectal arteries arise from the internal pudendal arteries. Their terminal branches pierce the wall of the rectum at variable points but usually in the lower third of the rectum. The presence of the middle rectal artery can be anticipated if the diameter of the terminal branches of the superior rectal artery is smaller than usual. Conversely, when the middle rectal arteries are absent, the superior rectal artery has larger size than usual [31].

3) Inferior rectal artery :

The inferior rectal arteries which are branches of the inferior iliac arteries arise from the pudendal artery (in Alcock's canal). They traverse the ischioanal fossa and supply the anal canal and the external sphincter muscles. There is no extramural anastomosis between the inferior rectal arteries and other rectal arteries. However, arteriography demonstrates an abundance of anastomoses among the inferior and superior rectal arteries at deeper planes in the walls of the anal canal and rectum.

**VENOUS DRAINAGE OF THE ANAL CANAL**

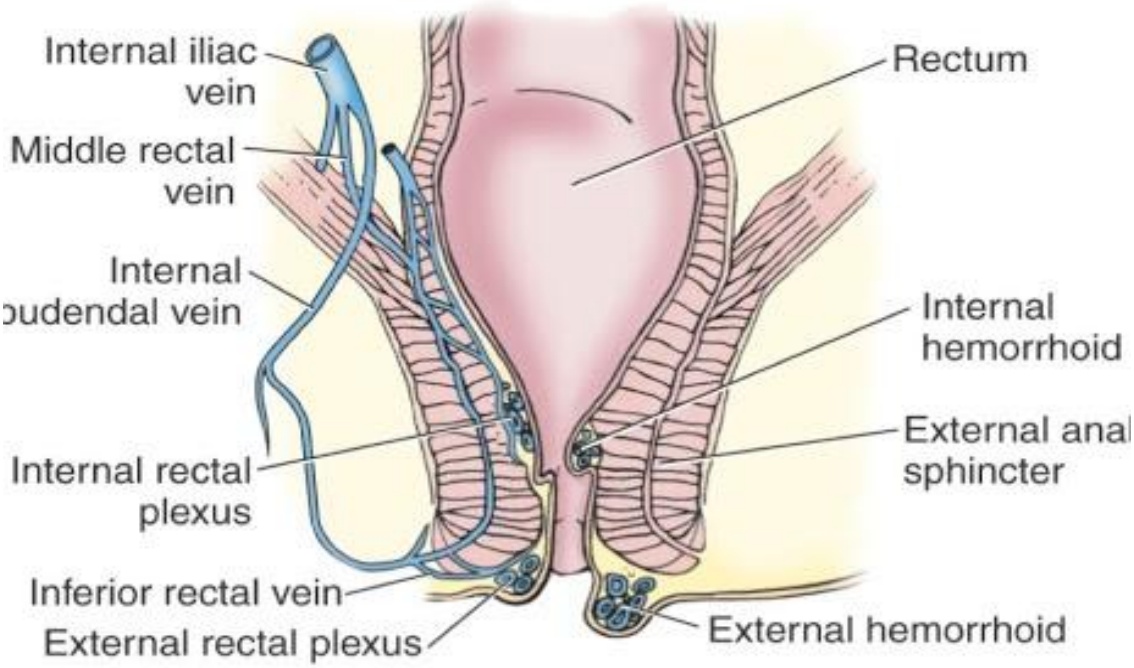



**Fig:11-Venous drainage of anal canal**

The upper half is drained by the *superior rectal vein* which later drain into the *inferior mesenteric vein* and the lower half is drained by the *inferior rectal vein* and later into the *internal pudendalvein*[1,9].

The mucous membrane of the upper two thirds of the anal canal contains a rich plexus of veins. These drain upwards by vertical channel which when filled with blood raise ridges in the mucous membrane known as Anal columns. The veins pass upwards in the submucosa to join the submucous plexus in the rectal ampulla.

The anal columns are joined by cross anastomosing veins which raise small submucosal folds known as Anal valves. These anastomosing cross channels form a venous ring known as *Annulus haemorrhoidalis* or *Zona haemorrhoidalis.*

The anal columns vary in prominence according to the amount of blood contained in them. The anal valves remain constant irrespective of the amount of blood in the annulus. At the lower end of the anal columns the tributary venous radicals show multiple dilatations which together with the thickenings of the corrugator cutis ani, make 3 anal cushions at 3, 7 & 11 o'clock positions when the patient is in the lithotomy position.

## LYMPHATIC DRAINAGE OF THE ANAL

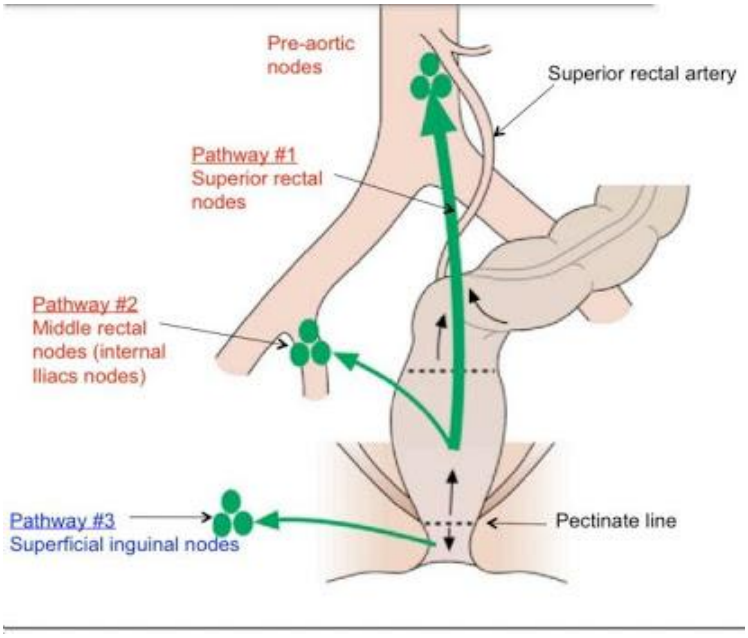



**Fig:12-Lymphatic drainage of anal canal**

The anal canal above the dentate line drains via the Superior rectal lymphatics to the inferior mesenteric nodes and laterally along both the middle rectal vessels and the inferior rectal vessels through the ischioanal fossa to the internal iliac nodes[1,2,3,9].

The analcanal below the dentate line usually drains to the inguinal nodes. It also can drain to the superior rectal lymph nodes or along the inferior rectal lymphatics through the ischioanal fossa if obstruction occurs in the primary drainage.

## Physiology of the anal canal

The physiology of the anorectal region is very complex and it is only recently that detailed investigations have given us a better understanding of its function [32].

## ANAL CONTINENCE

It is defined as the ability to control defecation voluntarily, to sense the quality of rectal contents and to maintain nocturnal control.

Maintaining anal continence is a complex matter because it is controlled by local reflex mechanisms as well as by conscious will. Normal continence depends on a highly integrated series of complicated events.

Stool volume and consistency are important because patients who have weakened mechanisms may be continent for a firm stool but incontinent for liquid feces.

Also significant is the rate of delivery of feces into the rectum, which emphasizes the reservoir function of the rectum

Other important factors include the sphincteric component, sensory receptors, mechanical factors and the corpus cavernosum of the anus.

### Stool Volume and Consistency

Stool weight and volume vary from individual to individual, from one time to another in a given individual, and from one geographic region to another. The frequency of passing stool may play some role in continence in that colonic transit time is rapid when the large bowel content is liquid because the left colon does not store liquid well.

Stool consistency probably is the most important physical characteristic influencing anal continence. The ability to maintain normal control may depend on nature of rectal contents either solid, gas or liquid. Some patients may be continent for solids tool but not for liquid or gas, or continent for stool but not for gas. This fact is important in the management of patients with anal incontinence because the maneuver of changing stool consistency from liquid into solid may be enough to allow the patient to regain faecal control.

## RESERVOIR FUNCTION OF RECTUM [33,34]

The distal part of the large intestine has a reservoir function that is important in the maintenance of anal continence and depends on several factors.

First, the lateral angulations of the sigmoid colon and the valves of Houston provide a mechanical barrier and retard progression of stool. The weight of the stool tends to accentuate these angles and enhances their barrier effect

The adaptive compliance of the rectum along with capacity of rectum and extensibility are the factors responsible for effective reservoir function.

Differences in pressure patterns between the distal and proximal levels of the analcanal result in the development of a force vector in the direction of the rectum. This continuous differential activity may be important in controlling the retention of small amounts of liquid matter and flatus in the rectum.

Furthermore, the angulation between the rectum and anal canal, which is due to the continuous tonic contraction of the puborectalis muscle as well as presence of high-pressure zone in the anal canal contribute to the reservoir function of the rectum.

**SPHINCTERIC FACTORS** [35,36]

Activity of the anal sphincters is generally believed to be the most important factor in maintaining anal continence. Within the anal canal the

sphincters are responsible for the *high-pressure zone*. The maximum anal resting pressure varies between 40and 80mmHgandprovide a barrier against intrarectal pressure. The high pressure zone, as demonstrated by pull-through recordings has an average length of 3.5 cm, and results mainly from the continuous tonic activity of both sphincters. The major contribution to the high-pressure zone comes from the internal anal sphincter.

Continuous tonic activity at rest and even during sleep has been recorded in the pelvic floor muscles and in the external sphincter. Although activity is always present in the external sphincter [(37)], its basal tone shows considerable variations, determined by postural changes. For example, external sphincter activity will increase when an individual is in an upright position. The activity also is augmented by perianal stimulation (anal reflex) and by increases in intra-abdominal pressure, such as coughing, sneezing, and the Valsalva maneuver. Rectal distention with initial small volumes also will result in increased activity.

## RECTAL SENSORY PERCEPTION [(38,39)]

The conscious sensation of urgency is mediated by extrinsic afferent neurons. These neurons are activated by mechanoreceptors. Although it has been suggested that these receptors are located in the

pelvic floor, there is growing evidence that the rectal wall itself contains many mechanoreceptors.

According to Ruhl et al, the filling state and contraction level of rectum are monitored by mechanoreceptors located in the rectal wall. These receptors are very rare or absent more proximally in the colon [40]. They do not act simply as tension and stretch receptors. They also detect mechanical deformation, such as flattening of myenteric ganglia.

Furthermore, they are able to encode the contractile activity of smooth muscle cells. Activation of the rectal mechanoreceptors induces extrinsic and intrinsic reflexes that play a key role in defecation.

**ANAL SENSORY PERCEPTION [41]**

A more precise perception of the nature of the rectal content is achieved by sensory receptors within the anal canal. Careful histologic studies have demonstrated an abundance of free nerve endings in the epithelium of the anal canal. Several types of sensory receptors have been identified: nerve endings that denote pain (free intraepithelial), touch (Meissners corpuscles), cold (bulbs of Krause), pressure or tension (Pacini corpuscles and Golgi-Mazzoni corpuscles), and friction (genital corpuscles).These nerve endings are present primarily in the lower half of the anal canal but may extend for 5-15mm above the dentate line. Pain

can be felt as far as 1-1.5 cm above the anal valves, this corresponds with clinical experience such as the application of rubber band ligation of haemorrhoids. The rectum is insensitive to stimuli other than stretch. Whether this sensory zone is important for anal continence remains controversial.

In a study in which a saline continence test was used and no effect could be demonstrated when the anal canal was anesthetized with lidocaine, leading the authors to conclude that anal canal sensation does not play a crucial role in continence [(42)].

However in a more recent study in which a technique to assess anorectal temperature sensation was used. It has been shown that very small changes in temperature can be detected in the anal canal. The lower and middle parts of the canal were found to be much more sensitive to temperature changes than was the upper part [(43)]. This finding supports the concept of the sampling response and reinforces the role of this sensory zone of the anal canal in maintaining continence.

## MECHANICAL FACTORS

1) ANGULATION BETWEEN RECTUM AND ANAL CANAL

The most important component for the conservation of gross fecal continence is anorectal angulation. This angulation of ano rectal system is due to the continuous tonic contraction of the puborectalis muscle.

As measured by defecography, the angle between the axis of the anal canal and the rectum in the resting state is about 90 degrees. Radiographic studies have elucidated changes in this angle during defecation.

**2) FLUTTER VALVE [44]:**

It has been suggested that additional protection of continence might be afforded by intra-abdominal pressure being transmitted laterally to the side of the anal canal just at the level of the anorectal junction. The anal canal is an anteroposterior slit-like aperture and any increased intra-abdominal pressure tends to compress it in a fashion similar to a flutter valve.

### 3) FLAP VALVE THEORY [45]:

According to the flap valve theory advanced by Parks et all, any increase in intra-abdominal pressure (weight lifting, straining, laughing, coughing) tends to accentuate the anorectal angle and force the anterior rectal wall to lie firmly over the upper end of the anal canal, which produces an occlusion or a flap valve effect.

The flap valve must be broken for defecation to occur. This breakage takes place by lengthening the puborectalis, lowering the pelvic floor, and obliterating the angle.

### Corpus Cavernosumof Anus [46]:

Stelzner postulated that the vascular architecture in the submucosal and subcutaneous tissues of the anal canal really represents what he called a corpus cavernosum of the rectum.

These cushions consist of discrete masses of blood vessels, smooth muscle fibers, elastic and connective tissue. They have a remarkably constant configuration and are located in the left lateral segment , right anterolateral segment, and right posterolateral segments of lower anal canal. These vascular cushions have the physiologic ability to expand and contract and to take up "slack," and hence they contribute to the finest degree of anal continence.

This theory might be supported by the fact that certain patients who have undergone a formal haemorrhoidectomy have minor alterations in continence, a situation that may be the result of excision of this corpus cavernosum.

## DEFECATION

### Usual Sequence of Events [9]:

Distention of the rectum is the stimulus for initiation of defecation. This in turn may be related to a critical threshold of sigmoid and possibly descending colon distention.

As long as fecal matter is retained in the descending and sigmoid colon, the rectum remains empty and the individual feels no urge to defecate.

Once begun, the act will follow cither of two patterns: (1) expulsion of the rectal contents, accompanied by mass peristalsis of the distal colon, which clears the bowel in one continuous movement, or *(2)* passage of the stool piecemeal with several bouts of straining. The pattern followed is largely determined by the habit of the individual and the consistency of the feces.

Distention of the left colon initiates peristaltic waves, which propel the fecal mass downward into the rectum. Rectal distention induces relaxation of the internal sphincter, which in turn triggers contraction of the external sphincter. Thus sphincter continence is induced.

The Valsalva maneuver is the second semi voluntary stage. This overcomes the resistance to the external sphincter by voluntarily increasing the intra-thoracic and intra-abdominal pressure. The pelvic floor descends, and the resulting pressure on the fecal mass in the rectum increases intra-rectal pressure. Inhibition of the external sphincter permits passage of the fecal bolus. Once evacuation has been completed, the pelvic floor and the anal canal muscles regain their resting activity and the anal canal is closed.

**FISSURE – IN-ANO**

A fissure-in-ano is a painful linear ulcer situated in the anal canal and extending from just below the dentate line to the margin of the anus. In the acute phase, the lesion is often a mere crack in the epithelial surface but may cause much pain and spasm [9, 10].

Anal fissure is the most common cause of severe anal pain. The pain of anal ulcer is intolerable and compare to the physical lesion, pain is disproportionate. Patient with anal fissure may avoid defecation for

days because of severe pain of defecation that leads to hardening of the stools causing further tears in anoderm during defecation, setting up a vicious cycle.

Fissures occur most commonly in the midline posteriorly, the least protected part of the anal canal. In males fissures usually occur in the midline posteriorly (90%) and much less commonly anteriorly (10%). In females fissures on the midline posteriorly are slightly commoner than anteriorly (60 : 40). The relative frequency of the anterior fissures in the females may be explained by the trauma caused by the foetal head on the anterior wall of the anal canal during delivery.

The predominantly posterior midline location of fissures has been explained by

a) Anal canal was more Posteriorly angulated
b) Relative posterior fixation of the anal canal,
c) Posterior Divergence of the fibres of the external sphincter muscle
d) Elliptical shape of the anal canal.

The fissures can be classified into

1] Acute or superficial :

Tear in the lower anal canal skin without any inflammatory induration or edema of lower anal canal called acute fissure in ano. Anal sphincter muscle spasm is always present.

2] Chronic fissure in ano.

Chronic fissure-in-ano is a deep canoe-shaped ulcer with thick edematous margins. At the upper end of the ulcer there is hypertrophied papilla. At the lower end of the ulcer there is a skin tag known as ‘sentinel pile’ (because it guards the anal fissure). Inflammation and in duration at the margins. Base consists of scar tissue and internal sphincter muscle. Spasm of the internal sphincter is always present. Sometimes infection may lead to abscess formation. Chronic fissure-in-ano may have a specific cause e.g. Crohn’s disease, ulcerative colitis, tuberculosis and syphilis, so during operation biopsy must be taken from a chronic fissure to exclude such secondary causes.

**CLINICAL FEATURE:**

Anal fissures are mostly seen between 30 and 50 years of age. But it is rare in the aged due to muscular atony.

Occasionally, patients develop anterior and posterior fissures simultaneously. In a review of 876 patients with fissure-in-ano, Hananel and Gordon [9] found the same sex distribution (women, 51.1%; men, 49.9%) with a mean age of 39.9 years (range, 13.5–95 years). The fissure was located in the posterior midline in 73.5%, the anterior midline in 16.4%, and in both in 2.6%..

In any event, the length of each fissure is remarkably constant, extending from just below the dentate line to the margin of anus and corresponding roughly to the lower half of the internal sphincter,

Constipated hard stool while passes through the anal canal in patients where there is spasm of internal sphincter and hypertrophied anal papilla an acute tear of the anal canal will occur. This Acute fissure will cause spasm, pain of the defaecation and passage of bright streaks of blood along with the stool or will be seen in the tissue paper. If the acute fissure fails to heal, it will gradually develop into a deep undermined ulcer. This is termed Chronic fissure-in-ano. A typical chronic fissure-in-ano will have in its upper end a hypertrophied anal papilla. At its lower end a tag of hypertrophic skin, which is called a sentinel pile and canoe-shaped ulcer in between the upper and lower ends.

**ETIOLOGY:**

The exact cause of anal fissures is unknown but many factors appear likely, such as the passage of large, hard stools, which may be the initiating factor; inappropriate diet; previous anal surgery; childbirth and laxative abuse and in patients with hypothyroidism.

Secondary fissures may occur as a result of either an anatomic anal abnormality or inflammatory bowel disease, particularly Crohn's disease

Previous anal surgery, especially Hemorrhoidectomy, Fistula-in-ano surgery may result in distortion of the anal canal with scarring and fixation of the anal skin. This decreased elasticity of the anal canal may then predispose to fissure formation. Some of the anterior fissures occurring in women result from childbirth. Perineal trauma leads to scarring and abnormal tethering of the anal submucosa, thus renderingit more susceptible to fissure because of its loss of laxity and mobility. Individuals with a long-standing condition of loose stools, usually resulting from chronic laxative abuse, may develop an anal stenosis with scarring, again predisposing to fissure formation

**PREDISPOSING FACTORS:**

It has been proved that constipation is the primary and sole cause of initiation of a fissure. Passage of hard stool, irregularity of diet, consumption of spicy and pungent food, faulty bowel habits, and lack of local hygiene can contribute for initiation of the pathology. In females, the ailment is usually triggered during pregnancy and following childbirth. It occurs as a superficial split in the anoderm that may heal by itself or may progress to a chronic fissure.

The anoderm is more adherent to the underlying tissue in the posterior midline. The Y-shaped decussation is formed by the sphincter fibers in the posterior midline that is anchored to the mucosa. Blood supply to the anoderm at the posterior midline is significantly lower .The reduced blood supply to the lesion is indicated by the absence of granulation tissue at the base of the fissure and a very slow growth of the anoderm even when the traditional conservative treatment eases the trauma due to hard faeces.

A well-developed idiopathic anal fissure rests directly over the internal sphincter and the circular fibers of this sphincter are visible on the floor of the fissure on naked eye inspection. The internal sphincter undergoes a perpetual state of spasm due to irritation and hypertrophies.

**PATHOGENESIS:**

Studies have demonstrated that after the initiation of a tear in the anal canal, chronicity is perpetuated by an abnormality in the internal anal sphincter. Most investigators have found that resting pressures within the internal anal sphincter are higher in patients with fissures than in normal controls

Nothmann and Schuster demonstrated that after rectal distention there is a normal reflex relaxation of the internal sphincter. In patients with anal fissures, this relaxation is followed by an abnormal ‘‘overshoot’’ contraction [47]. This phenomenon could account for the sphincter spasm and the pain. Furthermore, the authors demonstrated that after successful treatment of the fissure, the abnormal reflex contraction of the internal sphincter vanishes.

Adequate internal sphincterotomy appears to permanently reduce anal canal pressure, which suggests that abnormal activity in the sphincter contributes to the development of a fissure [48].

Elevated sphincter pressures may cause ischemia of the anal lining, possibly resulting in the pain of anal fissures and their failure to heal.

Schouten and Blankensteijn studied ultraslow wave pressure variations in the anal canal before and after lateral internal sphincterotomy. Ultraslow waves in the anal canal are discrete pressure fluctuations with a low frequency (1–2/min) and a high amplitude (10% above or below baseline resting pressure). These slow waves are associated with high maximal anal resting pressure and disappear when the high resting pressure is reduced by lateral internal sphincterotomy [(49)]. Posterior commissure is perfused more poorly than the other portion of the anal canal and postulated that this finding may play a role in the pathogenesis of fissure-in-ano. They suggested that vessels passing through the sphincter muscle are subject to contusion during periods of increased sphincter tone and that the resulting decrease in blood supply might lead to a pathogenetically relevant ischemia at the posterior commissure [(50)].

**SYMPTOMS:**

Pain and bleeding are the two main symptoms of this condition. Pain starting with and following defaecation (usually lasting an hour or more) has been described as sharp, cutting, tearing sensation during the actual passage of stool. Subsequently, the pain may be less severe and may be described as a burning discomfort that may persist from a few

minutes to several hours. Because of the anticipated pain, the patient may not defecate when the natural urge occurs, that leads to harder stools, with subsequent bowel movements more painful. Pain is sometimes intolerable.

The bleeding of anal fissure is variable, but usually occurs as streaks on the outside of the stool or spots noted on toilet tissue

Some patients have a large sentinel pile that draws their attention to the anus.

Discharge may lead to fecal soiling and pruritis ani due to increased moisture on the perianal skin.

Constipation is frequently touted as an accompanying symptom as well as an initiating symptom of anal fissure.

Sometimes patients with a painful fissure develop disturbances of micturition, namely dysuria, retention, or frequency.

**CLINICAL EVALUATION:**

The diagnosis of a fissure is usually straightforward and is made from the patient's history alone. A physical examination confirms the suspicion of fissure and rules out other associated disease.

Inspection is by far the most important step in the examination for anal fissure. If properly sought, most fissures can be seen. Because anal fissures are such extremely painful lesions, special care must be taken to make the examination as gentle as possible. Gentle separation of the buttocks usually reveals the fissure; however, spasm may keep the anal orifice closed, and the finding of spasm of a sphincter is suggestive of a fissure.

Nonvisualization of the lesion does not rule out its presence, and the diagnosis may be made more by history and palpation than by visual appearance. The triad of a chronic fissure includes a sentinel pile, an anal ulcer, and a hypertrophied anal papilla,

Palpation is the next step in the examination and confirms the presence of sphincter spasm. The digital examination is uncomfortable, with maximal tenderness usually elicited in the posterior midline. In fact, the pain may be so intense that a complete digital examination cannot be performed during the initial examination. However, it is essential that the

examination be performed later to exclude other lesions of the lower rectum such as polyp, and or carcinoma. With a chronic fissure, induration of the base and the lateral edges, as well as a hypertrophied anal papilla, may be palpable.

With an acute fissure, anoscopic examination is usually impossible because of the severe pain. With a chronic fissure, the ulcer itself will be noted as a triangular-shaped slit in the anal canal, with the floor being the internal sphincter. Just proximal to the ulcer, the hypertrophied anal papilla may be identified.

Sigmoidoscopy likewise may be impossible to perform during the initial examination, but it must be performed at a subsequent visit to rule out an associated carcinoma or inflammatory bowel disease.

A biopsy should be performed on any fissure that fails to heal after treatment. Such biopsy may reveal unsuspected Crohn’s disease or an malignancy.

Digital and proctoscopic examination usually cannot be done as it can cause severe pain and thus make it difficult to visualize the ulcer. At an interval of 4 to 6 weeks endoscopic examination can be done after relieving the pain by medical management or surgical for cases refractory to medical therapy

**Treatment of superficial fissures:**

It has long been recognized that superficial fissures can be cured conservatively. Constipation is probably the single most important etiological factor so it should be avoided. Patients should be reminded that they must maintain smooth bowel function because bouts of hard stools often result in recurrence of an already healed fissure. The aim of treatment of an acute fissure-in-ano is to break the cycle of a hard stool, pain, and reflex spasm.

The following methods are usually advocated for such type of simple fissures.

1. Warm water sitz bath with or without adding boric powder, povidone iodine solution, or potassium permanganate in the water. This treatment soothes the pain and relaxes the spasm of the internal sphincter for some time [51].
2. Adequate analgesia is necessary to break the vicious cycle of pain viz.avoidance of defecation for prolonged periods leading to hard stools resulting in further tearing of the anoderm and thereby inviting increased pain. suitable dose of analgesic consumed half an hour before going for defecation gives a good amount of post defecation pain relief.

3. Stool softening is essential as soft and formed stools negotiate the rectum and anal canal in non-traumatic physiologic maneuver. Plenty of oral fluids also help in keeping the stools soft.

4. High-fiber-diet and laxatives such as dulcolax; green leafy vegetables and fibrous fruits go a long way in increasing the bulk of stool leading to a smooth and swift act of defecation.

5. Reassurance and encouragement for not resisting the urge for defecation help prevent hard stools.

6. Application of local anesthetic cream or gel may help avoid the torture experienced in passage of stools in the patients with acute fissures. Ointments containing opiates, xylocaine, amethocaine, and cinchocaine to relieve pain, belladonna to alleviate sphincter spasm and silver nitrate to promote healing have been used since long. These mixtures are introduced on the finger or a short rectal bogie to ensure a thorough application over the desired part of the fissure. The modern practice is to insert the ointment over an anal dilator, which in addition helps relieve sphincter spasm. The possible complications of this treatment include pruritus due to allergy with the anesthetic agents and loss of anal dilator in the rectum [(52)].

**Chronic or complicated fissure in ano:**

The above mentioned approaches do not prove effective in the chronic variety of fissures in ano. These chronic or complicated fissures are not aminable to the aforesaid simple conservative line of treatment. A definitive therapy is needed to tackle this stubborn malady. The fissure is labeled as chronic or complicated if it fulfills the following criteria.

1. If not responding to conservative treatment.
2. If a fibrous anal polyp is present.
3. Presence of an external skin tag is noticed.
4. Presence of hemorrhoid is visible.
5. Induration is indicated at the edges of fissure.
6. If there is exposure of the fibers of the internal sphincter at the floor of the fissure.
7. The base of fissure is infected.
8. A bridged fissure with underlying fistula [a post fissure fistula] is diagnosed.

It has been experienced that fissure, complicated by any of the above factors, neither heal spontaneously nor does it respond to conservative therapy. Various therapies advocated for treating these

chronic fissures and which are presently in practice have been summed up in the following paragraphs. Such proven therapies may be grouped into non-operative and operative maneuvers.

**Non-operative techniques:**

**I) Injection of Botulinum Toxin-**

Botulinum toxin is known to cause paresis of the sphincter and thus 20 Units of type A botulinum toxin [Botox] diluted to 50 U/ml is injected bilaterally to the fissure[53]. The toxin exerts its effects on the acetylcholine releasing parasympathetic peripheral nerve endings as well as the ganglionic nerve endings, thereby leading to flaccid paralysis of the internal sphincter[54]. This causes sphincter paresis for about 3 months, a period which is sufficient for healing of a chronic non-complicated [not associated with sentinel tag, internal hemorrhoids, anal polyps or post fissure fistula] fissure.

It is well tolerated and can be administered on an outpatient basis. The healing rate reported is about 79%.

Drawback- The toxicity of the drug, accidental injection in the surrounding tissue amounting to general poisoning, haematoma and infection reported had discouraged regular use of this therapy.

**2) Oral Nifedipine-**

Nifedipine is an L-type calcium channels antagonist. L-type calcium channels are principle calcium channels in the GI smooth muscles. It has been used with variable effects in the management of achalasia cardia. In the treatment of anal fissures, 20 mg of Nifedipine is given twice daily. Nifedipine is found effective in relieving the sphincter spasm [(55)]. It is known for achieving increase in the local blood supply by an independent mechanism. This allows faster healing.

Drawback- It is, however, supposed to cause reversible internal anal sphincterolysis. Most of these drugs have a short duration of action and need to be administered 2-3 times daily. Similarly, side effects like headache, palpitations, flushing, dizziness, colicky abdominal pain, ankle edema, reduced taste and smell, nausea and diplopia have been reported.

**3) Local application of vasodilators**

Nitric oxide is an important neurotransmitter mediating internal anal sphincter relaxation. Glyceryl trinitrate (GTN) acts as a nitric oxide donor and when applied as a topical ointment, diffuses across the skin barrier and causes a reduction in internal sphincter pressure as well as improving anodermal blood flow through its vasodilatory effect on the anal vessels. These are the two mechanisms by which it is believed that the glyceryl trinitrate promotes anal fissure healing. Nitric oxide donors

such as glyceryl trinitrate [GTN] or isosorbide dinitrate are known to cause a chemical sphincterotomy leading to healing of fissure.

A 2% GTN ointment applied twice to the anoderm for 6 weeks results in a complete healing in 98% of patients. A few patients do experience mild headache during therapy. Lund and Scholefield [57] conducted a prospective randomized double-blind, placebo-controlled study to determine the efficacy of topical GTN 0.2% applied twice a day. After 8 weeks, healing was observed in 68% of patients compared to 8% of controls. Maximum anal resting pressures fell significantly from 115.9 to 75.9cm H2O with no change seen after placebo.

Jonas et al. [56] evaluated the efficacy of diltiazem for fissures that failed to heal with GTN. Diltiazem 2% was applied twice daily for 8 weeks or until the fissure healed. Fissures healed in 49% of patients within 8 weeks. Side effects occurred in 10% of patients and included perianal itching, but continued with treatment as they were generally well tolerated. Jonas et al. further assessed the effectiveness of oral versus topical diltiazem in the healing of chronic fissures. In a comparison of 60mg of oral diltiazem with 2% diltiazem gel, healing was noted to be complete in 38% of patients on the oral preparation compared to 65% on those receiving topical treatment. Oral diltiazem caused side effects of headaches, nausea, vomiting, reduced smell and taste, whereas no side effects were seen in those receiving topical therapy. They concluded that

topical diltiazem is more effective, achieving healing rates comparable to those reported with topical nitrates with significantly fewer side effects.

Drawbacks- However, during the course of therapy, strict dietary restrictions to smoothen the stool are necessary. Headache during therapy is a major concern with the incidence as high as 20 - 100%. Though the application of GTN has a high healing rate; it also has a high recurrence rate.

**4) Direct current probe treatment:**

This method is tried in patients of chronic anal fissures with associated internal hemorrhoids. A study claimed that when the DC probe [Ultroid, Homeron] was applied to the internal hemorrhoids, the patients were relieved of anal pain and healing occurred in 90% of patients.

**Drawbacks:**

However, this mode of treatment requires special equipment and the procedure takes a very long time to be performed about l0 minutes for each hemorrhoid. Moreover, the mechanism of action on the part of fissure is also not understood. A case of complication in the form of perianal abscess and fistula requiring surgery has been reported following DC probe treatment.

**5) Endoscopic anal dilatation-**

In this procedure, anal dilatation is performed with a two-valved anoscope under local anesthesia as an office procedure. This procedure is said to be free of discharge or defect of continence either transient or permanent. In a series, a Parks' retractor [61] or a recto sigmoid balloon has been used for sphincter dilatation. Out of 495 patients treated through this procedure, it is reported that in as many as 87- 88% of the patients, the fissures were healed within 3 months.

**Drawback:**

As many references are not available in support of this technique, it will be hazardous to comment on the efficacy or otherwise of this procedure.

**6) Chemical cauterization:**

This is done by using silver nitrate or phenol-in-glycerine. This procedure may be repeated a couple of times until healing occur. It takes about 4 to 8 weeks for complete healing of the fissure.

**Drawbacks:**

The toxicity of the drugs, accidental injection in the surrounding tissue amounting to general poisoning, hematoma and infection reported refrained the surgeons from regularly resorting to this method.

**OPERATIVE TECHNIQUES:**

**7) Stretching of anal sphincter [Lord's anal dilatation]-**

Anal dilatation was described by Recamier in 1838. This was one of the most favoured and accepted methods of treating the chronic anal fissures. This procedure was very simple, Since almost no instruments are needed for this procedure, it could be performed at the primary health centers or inadequately equipped hospitals situated at small townships.

In a review by Lund and Scholefield [57] of 16 trials examining the use of anal dilatation, reported recurrence rates were 2.2–56.5% and tended to be higher with longer follow-up. Disturbance of continence ranged from 0% to 39.2% for incontinence of flatus or soiling of the underclothes and fecal incontinence was reported in up to 16.2%. Anal dilatation may also be complicated by bleeding, perianal bruising, strangulation of prolapsed hemorrhoids, perianal infection, Fournier's gangrene, bacteremia, and rectal procidentia.

Anal dilatation helps in healing of the fissure by reducing the anal canal pressure. If performed with due care by avoiding excessive manipulation, it does not cause any damage to the external anal sphincter as feared. In experienced hands, incontinence of stools or flatus is seldom seen.

**Drawback:**

However, recent studies have shown that anal dilation has a higher risk of fissure persistence and higher risk of incontinence. Although the procedure in itself is curative, in cases with associated pathologies, it has to be supplemented with an additional procedure.

**8) Excision of the anal fissure (Fissurectomy):**

Fissure containing triangular anoderm is excised proceded by anal stretch. Using an excisional technique in 86 patients in the outpatient setting, Badejo (58) reported 100% healing at two weeks, with no complications and no recurrences at 12-month follow-up. Such uniformly excellent results have never been reported by other authors. In his review, Abcarian found that the complication rate ranged from 6% to 50%, some with persistent fecal soilage. Reported recurrences rates were 6–8%.

**Drawback :**

Howsoever good and reliable this operation is, it leaves behind a large and rather uncomfortable external wound, which takes a long time to heal.

**9) Fissurectomy with immediate skin grafting:**

To expedite healing and shorten the convalescence, application of a split thickness graft to the wound is advocated by a section of the proctologists.

**Drawbacks:**

The procedure is a time consuming, rather finicky one. It needs a hospital stay of about a week to keep patients bowel held up to avoid possible detachment of the graft. Precisely, for these reasons, the procedure could not get enough acclamation and acceptance.

**10) Internal anal sphincterotomy** –

Internal anal sphincterotomy to relieve the sphincter spasm is presently considered the preferred therapy for chronic, recurrent and non-healing fissures.

Two techniques have been described :

**A. Open posterior internal sphincterotomy**. Posterior sphincterotomy is done by dividing the sphincter fibers through the fissure wound.

Drawbacks : The wound is slow to heal and has a tendency to lead to aposterior midline keyhole defect[8] that may cause a persistent seepage or difficulty in continence.

**B. Lateral subcutaneous internal sphincterotomy.** It is one of the most favoured procedures. The reasons for this are the simplicity of the procedure, minimal anesthesia requirements, and good results [60]. The lists of complications that can arise due to the procedure are formidable; but with careful and experienced hands these could be effectively handled and the procedure could be made safe and simple.

**Drawbacks:**

The most common complications encountered are bleeding needing hospitalization, abscess and fistula formation, incontinence to flatus and feces, and recurrence.

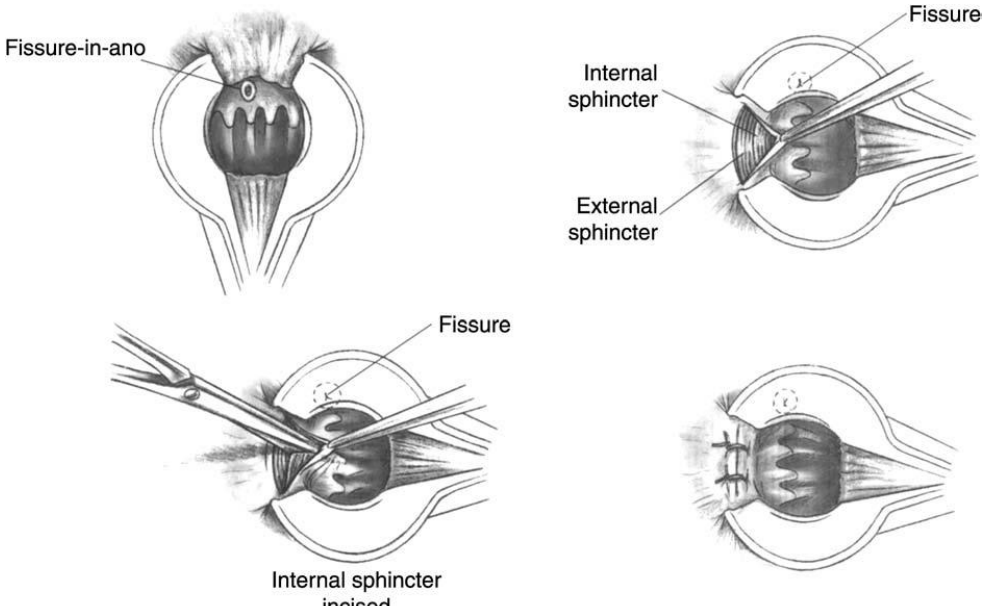



**Fig:13-Lateral internal sphincterotomy (open technique)**

Both the procedures can be done either under a local or a general anesthesia depending upon personal preference of the surgeon based on his experience and attitude of the patient.

**11) Combined outpatient surgical and cryotherapeutical treatment-**

A lateral anal sphincterotomy, which is done under local anesthesia, is followed by fissure curettage with N protosside cryosound. This is claimed to be a quicker and more effective procedure.

**Drawback**

The additional maneuver is not found to be of any specific advantage and so it has not found many takers.

**Fig:14-Lateral internal sphincterotomy intra operative Picture**

**12) Carbon dioxide laser surgery-**

It involves laser vaporization of the fissure locally. The internal sphincter can be incised using this laser. In long-standing fissures, some degree of anal stenosis is present. It can be used to give relieving incisions in the three quadrants other than the fissure before the fissure is attended.

**Drawbacks-**

The high cost of the laser unit seems to be the major deterrent in its wider acceptance.

**13) Anal Advancement Flap**

A method of using excision of fissure combined with an advancement flap anoderm has been referred to be V-Y anoplasty, with this technique, the anoderm containing fissure, adjacent hemorrhoidal tissue are completely excised. A triangular skin flap based outside the anal canal is elevated in continuity with the excised fissure. A broad base with adequate blood supply to the flap must be ensured. The flap is adequately mobilized to avoid tension on the suture line. Meticulous attention is paid to haemostasis which leads to hematoma formation, increases tension and chance of post-operative infection. The flap is then advanced and the defect of the skin and the anal canal is closed [(59)].

**Advantages**

Postoperative pain decreased

Postoperative complications decreased

Healing is more rapid and there is a decreased scar tissue and resultant deformity

**Disadvantages**

Involves considerable dissection and require increased operative time.

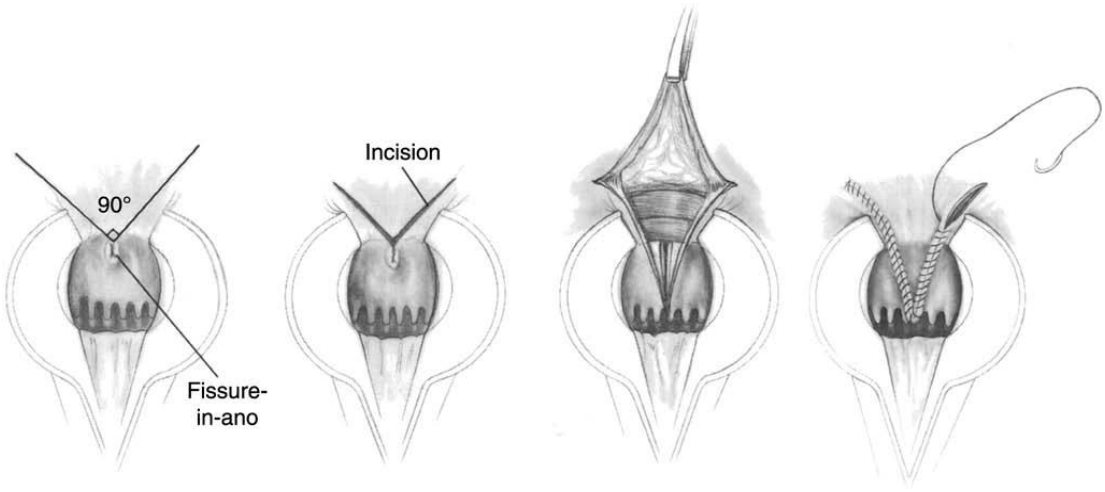



**Fig:15-Anal advancement flap**

**Fig:16-Anal advancement flap intra operative Picture**

# METHODOLOGY

## MATERIALS AND METHODS

**Design of the study :** **A** prospective study

**Place where the study was conducted:**

Department of General Surgery,

Government medical college hospital,

Coimbatore.

**Study period :**

One year, commencing from August- 2014 ending by July- 2015

**Study population:**

Patient with chronic anal fissure from all surgical unit (S1-S6) who were not responding to conservative management.

**Sample size : 50**

**Inclusion criteria:**

Patient in the age group of 15-80 years in both sex with chronic anal fissure not responding to conservative management.

**Exclusion criteria:** Patient with either of following

Pregnant patient

Patient with acute fissure

Patient with large sentinel tag

Patient with age >80 years

Patient with signs and symptoms of coagulopathy

Patient not capable of giving consent

Patient unwilling to undergo the study (who refused to give consent)

Patient with history of fecal incontinence or anal stenosis.

**Preoperative evaluation:**

Patient with chronic anal fissure were admitted in respective surgical units. Most of the fissures were in posterior midline. They were thoroughly evaluated by doing all basic investigations (Hb%, random blood sugar, blood urea, serum creatinine) ECG, plain radiograph of the chest PA view. Examination of anal region was done. Proctoscopic examination was done to visualize the fissure and associated haemorrhoids if any. Per rectal examination was carried out. Patient were excluded on the basis of the above criteria. Those patient fitting into the inclusion criteria were planned for surgery after anaesthetic assessment.

**Preoperative preparation:**

Patient posted for surgery were put on liquid died 24 hours before surgery. They were put on nil by mouth 10 hours before surgery. Patient were administered soap and water enema on previous night and the morning of surgery.

**Anaesthesia:**

Patient were administered either general or regional anaesthesia as deemed fit by theatre anaesthesiologist.

**Operative procedure:**

Either of two were carried out after obtaining informed consent.

**A. Lateral internal sphincterotomy (open technique) (Group A)**

The patient was placed in lithotomy position. The intersphincteric groove was palpable at the anal verge. The procedure was carried out in open method. A 1to2 cm circumferential incision was made over the free edge of the internal sphincter. Blunt dissection was used to open the plane inside and outside the internal sphincter to free it. The free lower edge of the internal sphincter was then grasped, drawn into the wound and it's distal portion was divided .The sentinel skin tag at the lower end of the fissure was excised. Tight T-bandage was applied after dressing.

**B. Lateral internal sphincterotomy with anal advancement flap (Group B)**

Lateral internal sphincterotomy was performed in a standard open technique. A 1to2 cm circumferential incision was made over the free edge of the internal sphincter. Blunt dissection was used to open the plane inside and outside the internal sphincter to free it. The free lower edge of the internal sphincter was then grasped, drawn into the wound and it's distal portion was divided .Then the anal advancement flap was performed, briefly, after excising the fissure and the adjacent crypt bearing haemorrhoidal tissue, by an triangular V shaped incision starting from the free edge of the anal fissure about 3 cm from the anal verge away from the midline. A V-shaped flap formed of skin and sub cutaneous fat was elevated in continuity with the excised fissure sufficiently to allow advancement to cover the fissure defect. Abroad base with adequate blood supply to the flap must be ensured. The flap is adequately mobilized to avoid tension on the suture line. Meticulous attention is paid to hemostasis which leads to hematoma formation, increases tension and chance of post operative infection. The flap is then advanced. The base of the flap was sutured to the lower anal canal mucosa with interrupted 3-0 vicryl.

**Postoperative care:**

Both group of patient were encouraged to resume oral feeding after 6hours of surgery .Non opioid analgesics were given to all patients. Pain was assessed using visual analog scale (VAS) .Pain was considered as severs when VAS >5.

| Visual Analog Scale | Characteristic |
|---|---|
| 0 | No pain |
| 5 | Moderate pain |
| 10 | Severe pain |

Data concerning the 2 groups were then compared.

Complications such as urinary retention, bleeding were watched for and recorded dressing was removed on the first postoperative day. They were started on normal diet .lactulose 20 ml once daily was started on 2$^{nd}$ postoperative day and continued for 2 weeks. Warm sitz bath were advised and bulking agents were prescribed.

**Discharge**

Patients are allowed to go home when fully comfortable on oral analgesics, fully mobile, and tolerating normal diet.

**Follow up:**

Patients were followed up on outpatient basis, the visit was scheduled within one week. The second visit scheduled on subsequent week. Further follow-up was scheduled 6 weeks after the previous visit. This was to be followed by monthly visit. During each visit, enquiries were made regarding the expected complications. Patient were also examined to rule out anorectal sepsis, incontinence to flatus and fecal soiling, anal stenosis. Results of follow up were tabulated and analyzed.

**Primary outcome measures:**

Complete healing(complete epithelization)

**Secondary outcome measures:**

Operative time

Length of hospital stay

Anal continence

Time relief of pain

Complications (urinary retention, infection, flap necrosis)

Recurrence

**Analysis**

The data collected was tabulated, calculated, evaluated and analyzed.

# RESULTS

This study included 50 patients with chronic anal fissure. All the patients underwent a lateral internal sphincterotomy. A total of 30 patients were randomized to receive only lateral internal sphincterotomy (Group A) and the remaining patients were subjected to anal advancement flap.

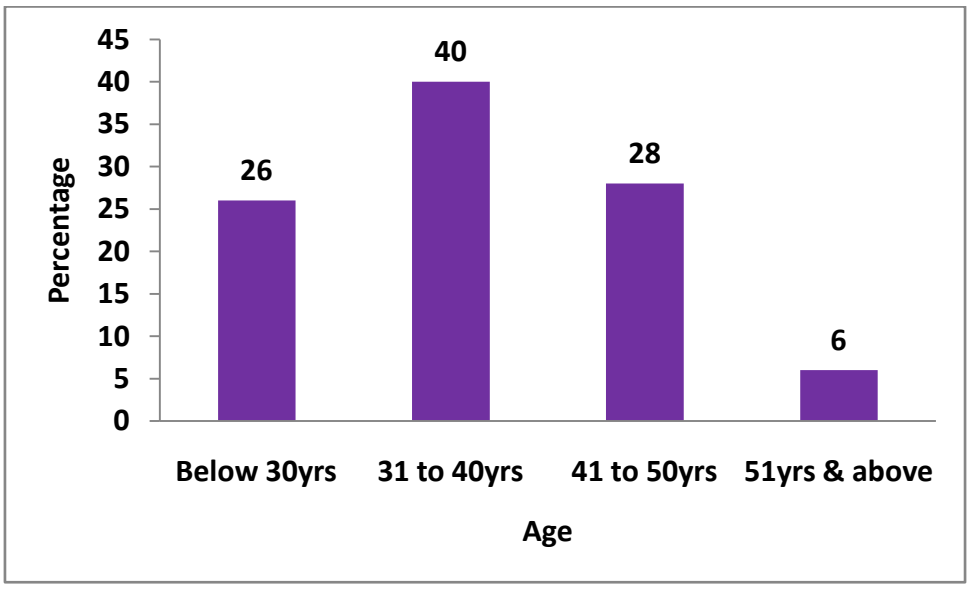
## 1. AGE DISTRIBUTION OF PATIENTS

**TABLE-1**

**AGE DISTRIBUTION**

| Age | Frequency (n=50) | Percentage (100%) |
|---|---|---|
| Below 30yrs | 13 | 26.0 |
| 31 to 40yrs | 20 | 40.0 |
| 41 to 50yrs | 14 | 28.0 |
| 51yrs & above | 3 | 6.0 |

**CHART**




Most of the patients in our study was found to be in adult aged between 31 to 40 years.40% of patients are from this age group. Mean age of presentation was

## 2.SEX WISE DISTRIBUTION OF PATIENTS:

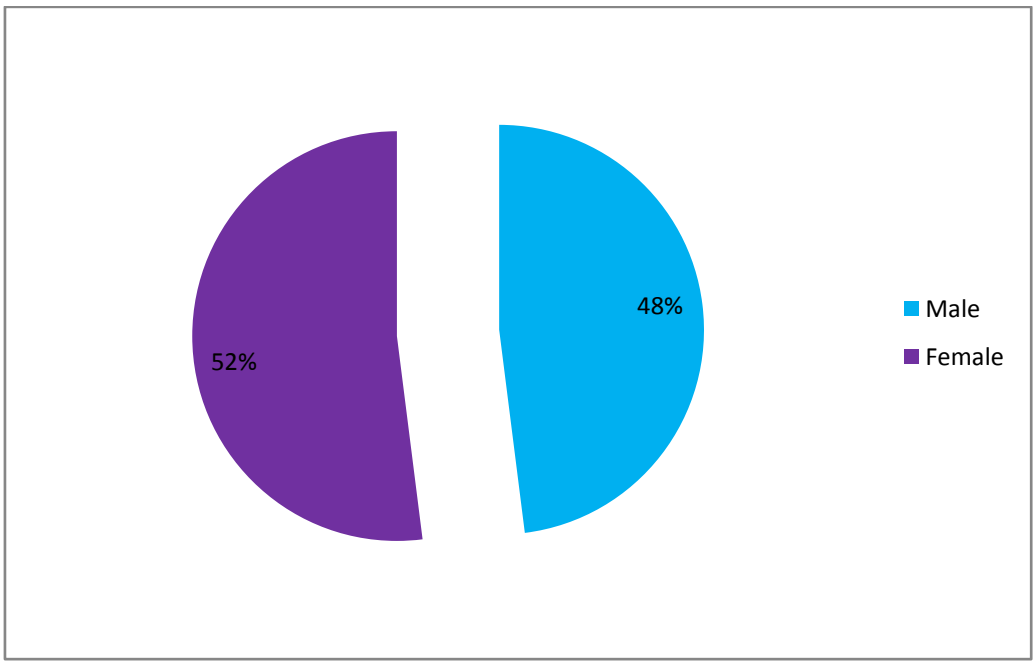
**TABLE 2**

**SEX DISTRIBUTION**

| Sex | N0 of patients (n=50) | Percentage (100%) |
|---|---|---|
| Male | 24 | 48.0 |
| Female | 26 | 52.0 |

Majority of the patients were female adults 26 as against 24 male patients

**CHART 2**



## 3. ASSOCIATED DISEASES:

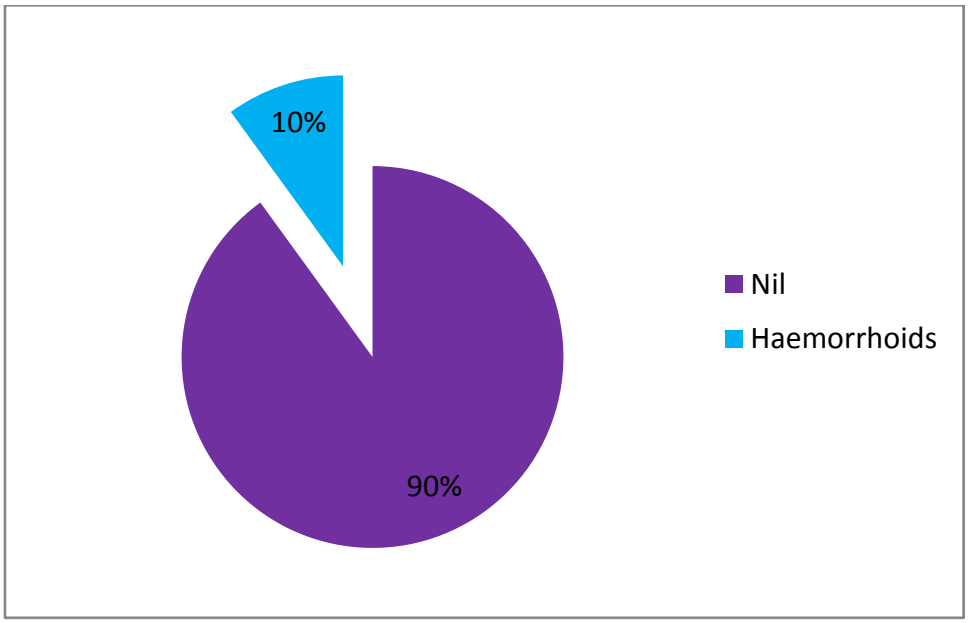
### TABLE 3

### ASSOCIATED CONDITION

| Associated condition | Frequency (n=50) | Percentage (100%) |
|---|---|---|
| Nil | 45 | 90.0 |
| Haemorrhoids | 5 | 10.0 |

5 of our patients (10%) had an associated haemorrhoids.

### CHART 3



## 4 . DISTRIBUTION OF SURGERIES:

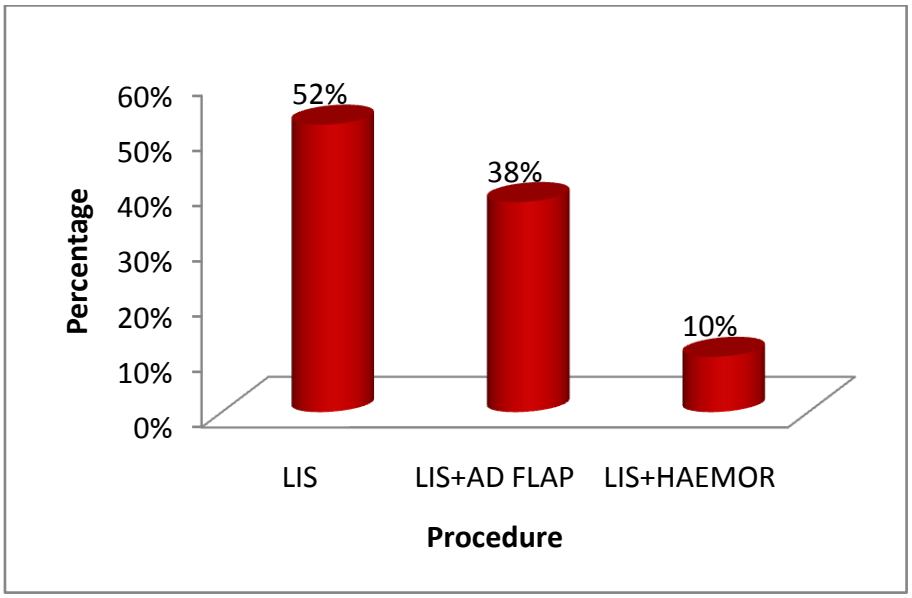
### TABLE-4

### PROCEDURE DONE

| Procedure | No of patients (n=50) | Percentage (100%) |
|---|---|---|
| LIS | 26 | 52.0 |
| LIS+AD FLAP | 19 | 38.0 |
| LIS+HAEMOR | 5 | 10.0 |

26 patients (52%) of total 50 patients underwent lateral internal sphincterotomy,19 patients (38%) underwent lateral internal sphincterotomy with anal advancement flap,5 patients underwent lateral internal sphincterotomy with haemorrhoidectomy.

### CHART -4



## 5. RETENTION OF URINE:

### TABLE -5

### URINARY RETENTION

| Urinary retention | No of patients (n=50) | Percentage (100%) |
|---|---|---|
| Nil | 42 | 84.0 |
| Yes | 8 | 16.0 |

8 patients of total 50 had urinary retention in their immediate post-operative period.

### CHART - 5

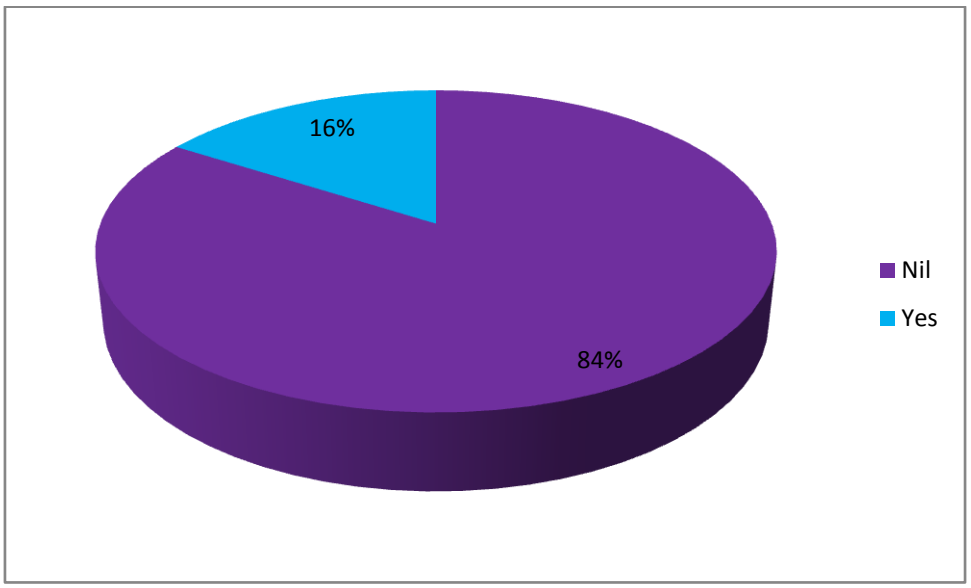


**TABLE - 6**

**FLAP NECROSIS**

| Flap necrosis | No of patients (n=50) | Percentage (100%) |
|---|---|---|
| Nil | 49 | 98.0 |
| Yes | 1 | 2.0 |

Out of total 50 patients one patient developed flap necrosis

**TABLE -7**

**ANAL STENOSIS**

| Particulars | Frequency (n=50) | Percentage (100%) |
|---|---|---|
| Nil | 50 | 100.0 |

There were no reports of anal stenosis among the patients.

**TABLE - 8**

**RECURRENCE**

| Recurrence | Frequency (n=50) | Percentage (100%) |
|---|---|---|
| Nil | 50 | 100.0 |

There were no reports of any recurrence.

**TABLE -9**

**INCONTINENCE TO FLATUS OR FECAL SOILING**

| Incontinence | No of patients (n=50) | Percentage (100%) |
|---|---|---|
| Nil | 47 | 94% |
| Yes | 3 | 6% |

Out of total 50 patients 3 patient developed fecal incontinence.

**TABLE -10**

**DESCRIPTIVE STATISTICS**

| Items | Duration of Surgery(min) | Time Relief of pain(Days) | No of hospital stay(Days) |
|---|---|---|---|
| Mean | 65.44 | 6.34 | 4.98 |
| Median | 60.00 | 6.00 | 5.00 |
| S.D | 22.683 | 3.274 | 1.204 |
| Min | 27 | 2 | 3 |
| Max | 110 | 16 | 7 |

Mean duration of surgery 65.44 minutes

Mean time relief of pain 6.34 days

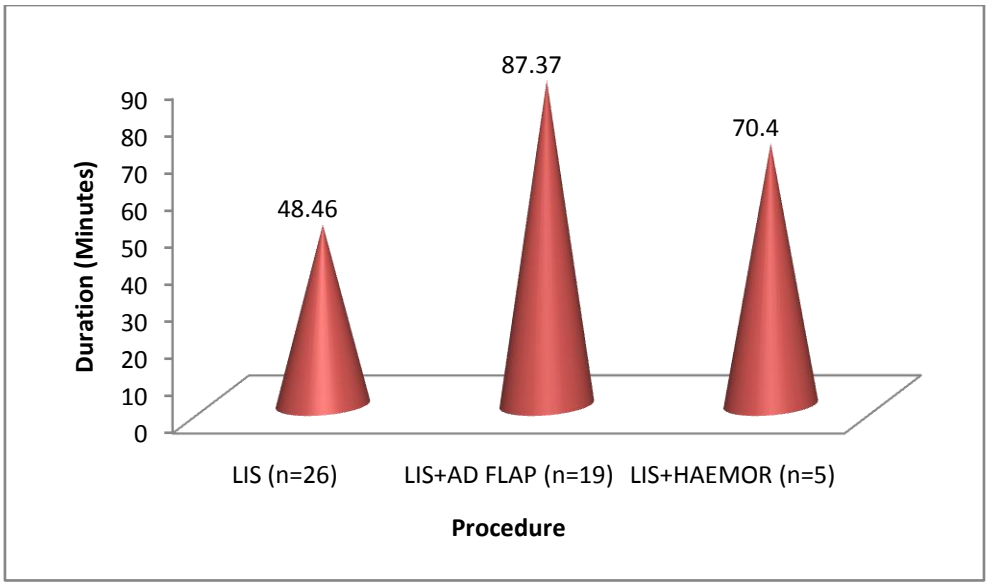
Mean duration of hospital stay 4.98 days

**TABLE -11**
**COMPARISON OF MEAN DURATION OF SURGERY IN STUDY GROUP**

| Duration of surgery(min) | Mean | S.D | SS | Df | MS | Statistical inference |
|---|---|---|---|---|---|---|
| Between Groups | | | 16754.237 | 2 | 8377.119 | F=46.550 .000<0.05 Significant |
| *LIS (n=26)* | 48.46 | 11.639 | | | | |
| *LIS+AD FLAP (n=19)* | 87.37 | 13.981 | | | | |
| *LIS+HAEMOR (n=5)* | 70.40 | 19.705 | | | | |
| Within Groups | | | 8458.083 | 47 | 179.959 | |

Mean duration of surgery in cases of lateral internal sphincterotomy was 48.46 minutes as compared to 87.37 minutes in lateral internal sphincterotomy with advancement flap surgeries,this shows advancement flap surgeries require increased operative time.

**CHART -6**



## TABLE - 12

## COMPARISON OF TIME RELIEF OF PAIN IN STUDY GROUPS(DAYS)

| Time relief of pain(days) | Mean | S.D | SS | Df | MS | Statistical inference |
|---|---|---|---|---|---|---|
| Between Groups | | | 245.853 | 2 | 122.927 | F=20.681 .000<0.05 Significant |
| *LIS (n=26)* | 7.54 | 2.083 | | | | |
| *LIS+AD FLAP (n=19)* | 3.68 | 1.204 | | | | |
| *LIS+HAEMOR (n=5)* | 10.20 | 6.017 | | | | |
| Within Groups | | | 279.367 | 47 | 5.944 | |

Mean duration of time of pain relief in cases of lateral internal sphincterotomy was 7 days as compared to 3 days in lateral internal sphincterotomy with advancement flap surgeries, patients with advancement flap surgeriesare more comfortable in post- operative period

## CHART – 7

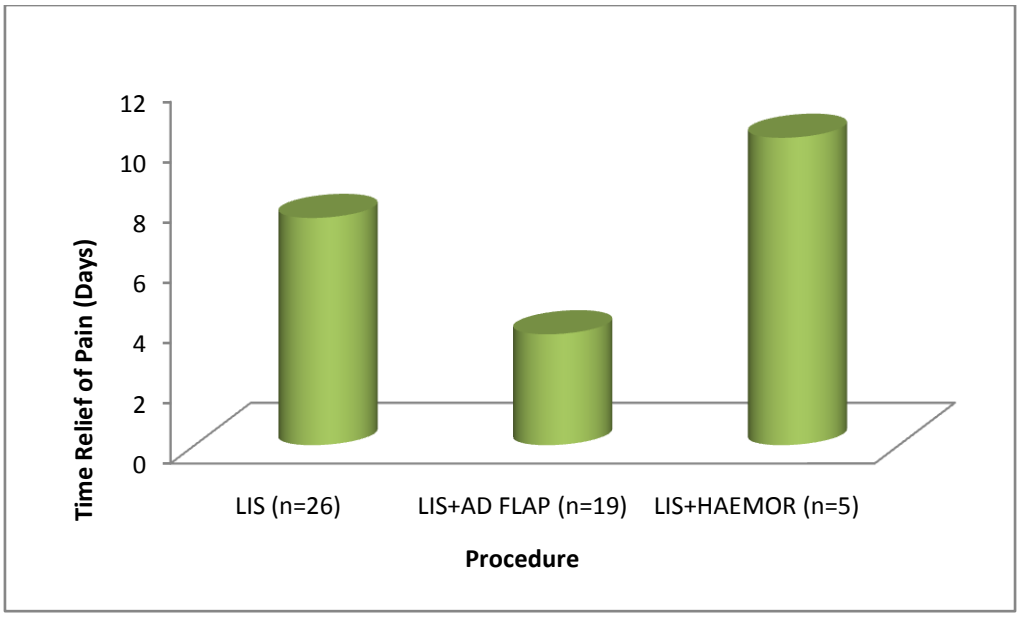
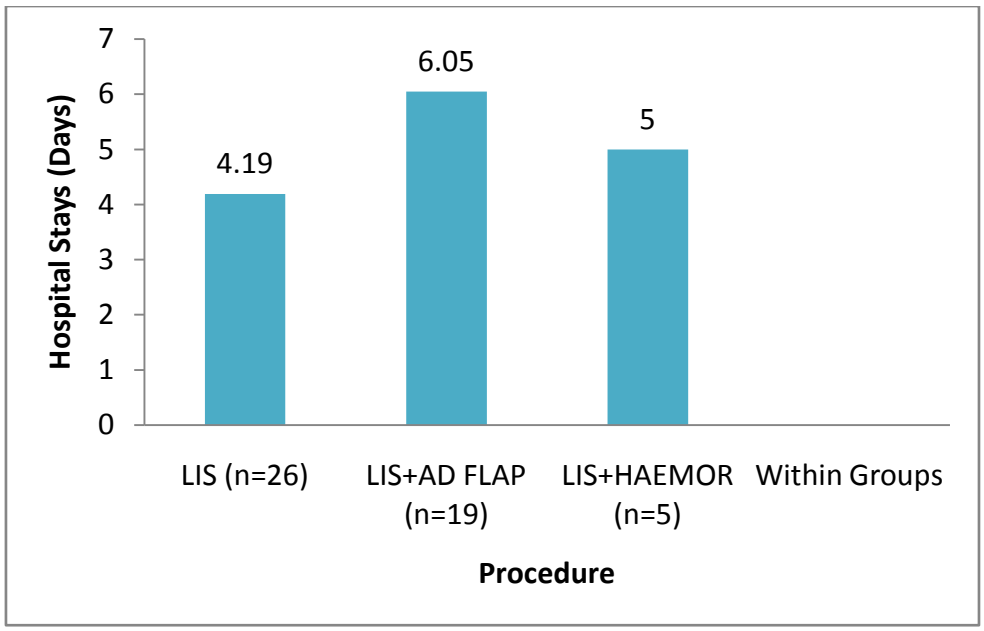


**TABLE -13**
**COMPARISON OF MEAN DURATION OF HOSPITAL STAY(DAYS)**

| No of hospital stay(days) | Mean | S.D | SS | Df | MS | Statistical inference |
|---|---|---|---|---|---|---|
| Between Groups | | | 37.994 | 2 | 18.997 | F=27.068 .000<0.05 Significant |
| *LIS (n=26)* | 4.19 | .895 | | | | |
| *LIS+AD FLAP (n=19)* | 6.05 | .621 | | | | |
| *LIS+HAEMOR (n=5)* | 5.00 | 1.225 | | | | |
| Within Groups | | | 32.986 | 47 | .702 | |

Mean duration of hospital stay in cases of lateral internal sphincterotomy was 4 days as compared to 6 days in lateral internal sphincterotomy with advancement flap surgeries, patients with advancement flap surgeries are need more no of post- operative period hospital care.

**CHART -8**



## TABLE-14

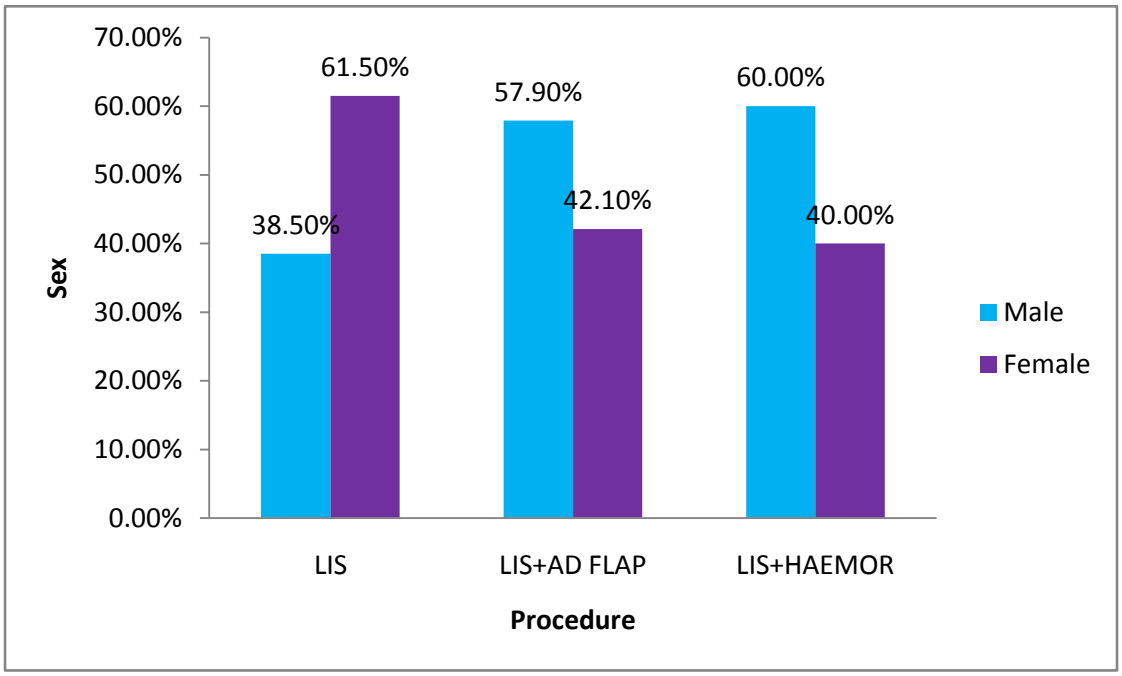
## DISTRIBUTION OF PROCEDURE

### Chi-square test

| SEX | q6.PROCEDURE DONE | | | | | | | | Statistical inference |
|---|---|---|---|---|---|---|---|---|---|
| | LIS | | LIS+AD FLAP | | LIS+HAEMOR | | Total | | |
| | (n=26) | (100%) | (n=19) | (100%) | (n=5) | (100%) | (n=50) | (100%) | |
| Male | 10 | 38.5% | 11 | 57.9% | 3 | 60.0% | 24 | 48.0% | $X^2$=1.981 Df=2 .371>0.05 Not Significant |
| Female | 16 | 61.5% | 8 | 42.1% | 2 | 40.0% | 26 | 52.0% | |

Among the total 24 male patients, 10 patients underwent lateral internal sphincterotomy,11 patients underwent lateral internal sphincterotomy with advancement flap,out of 26 females 8 underwent lateral internal sphincterotomy with advancement flap

### CHART - 10



## TABLE - 15

## COMPARISON URINARY RETENTION IN STUDY PROCEDURES

### Chi-square test

| Urinary retention | PROCEDURE DONE | | | | | | | | Statistical inference |
|---|---|---|---|---|---|---|---|---|---|
| | LIS | | LIS+AD FLAP | | LIS+HAEMOR | | Total | | |
| | (n=26) | (100%) | (n=19) | (100%) | (n=5) | (100%) | (n=50) | (100%) | |
| Nil | 21 | 80.8% | 16 | 84.2% | 5 | 100.0% | 42 | 84.0% | $X^2$=1.155 Df=2 .561>0.05 Not Significant |
| Yes | 5 | 19.2% | 3 | 15.8% | 0 | .0% | 8 | 16.0% | |

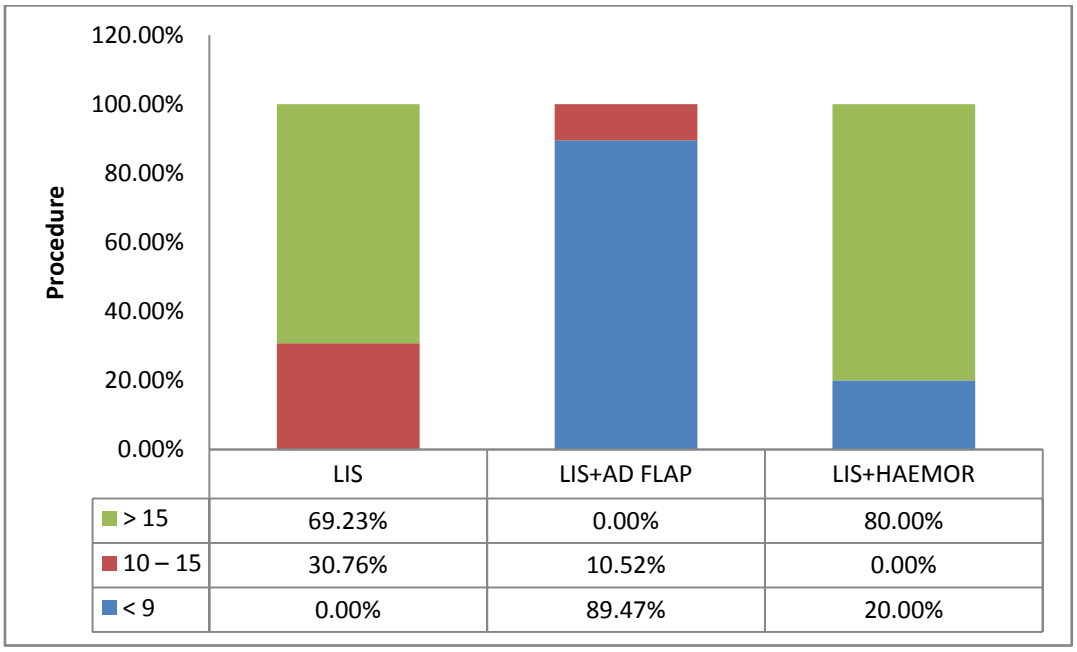
We observed in our study that total 26 lateral sphincterotomy group 5 patients(19.2%) develop urinary retention as compared to 3 out of 19 (15.8%) in lateral sphincterotomy with advancement flap group. we found that no significant relationship between urinary retention and the operation which was performed.

## TABLE-16

## COMPLETE HEALING

| Complete Healing (days) | PROCEDURE DONE | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | LIS | | LIS+AD FLAP | | LIS+HAEMOR | | Total | |
| | (n=26) | (100%) | (n=19) | (100%) | (n=5) | (100%) | (n=50) | (100%) |
| < 9 | 0 | 0.00% | 17 | 89.47% | 1 | 20.0% | 18 | 36.0% |
| 10 – 15 | 8 | 30.76% | 2 | 10.52% | 0 | 0.00% | 10 | 20.0% |
| > 15 | 18 | 69.23% | 0 | 0.00% | 4 | 80.0% | 22 | 44.0% |

## CHART - 9




In our study complete healing was achieved earlier (9 days) in lateral internal sphincterotomy with advancement flap group compared to lateral internal sphincterotomy alone group were healing achieved after 10 days.

## TABLE-17

## COMPARISON OF FLAP NECROSIS IN STUDY PROCEDURES

### Chi-square test

| Flap Necrosis | PROCEDURE DONE | | | | | | | | Statistical inference |
|---|---|---|---|---|---|---|---|---|---|
| | LIS | | LIS+AD FLAP | | LIS+HAEMOR | | Total | | |
| | (n=26) | (100%) | (n=19) | (100%) | (n=5) | (100%) | (n=50) | (100%) | |
| Nil | 26 | 100.0% | 18 | 94.7% | 5 | 100.0% | 49 | 98.0% | $X^2$=1.665 Df=2 .435>0.05 Not Significant |
| Yes | 0 | .0% | 1 | 5.3% | 0 | .0% | 1 | 2.0% | |

In our study that total19 patients who underwent lateral sphincterotomy with advancement flap one patient had flap necrosis in follow up period.

## TABLE-18

## INCONTINENCE TO FLATUS OR FECAL SOILING

### Chi-square test

| Incontinence/ Fecal soiling | PROCEDURE DONE | | | |
|---|---|---|---|---|
| | LIS | LIS+AD FLAP | LIS+HAEMOR | Total |
| Nil | 24(51.06%) | 18(38.29%) | 5(10.20%) | 47 |
| Yes | 2(66.6%) | 1(33.3%) | 0 | 3 |
| Total | 26 | 19 | 5 | 50 |

$\chi^2$ =38.573 df=3 p<0.001

Majority of the study subjects was not having fecal soiling or in continence. Out of 3 subjects having fecal soiling was present in LIS group(66.6%) followed by LIS +AD FLAP(33.3%) and it was statistically significant. The test revealed that there was significant relationship between fecal soiling or incontinence and the operation which was performed.

## TABLE-19

## PERSISTENCE OF SYMPTOMS

### Chi-square test

| Persistence of symptoms | PROCEDURE DONE | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | LIS | | LIS+AD FLAP | | LIS+HAEMOR | | Total | |
| | (n=26) | (100%) | (n=19) | (100%) | (n=5) | (100%) | (n=50) | (100%) |
| Nil | 21 | 80.76 | 16 | 84.22 | 3 | 60 | 40 | 80 |
| Yes | 5 | 19.24 | 3 | 15.78 | 2 | 40 | 10 | 20 |

In our study out of 50 patients 10 patients had persistence of symptoms even after two weeks of surgery. But these symptoms improved with conservative management. After 6 weeks during the follow up period no recurrence of disease were observed.

# DISCUSSION

Anal fissure is a common problem that causes substantial morbidity in who are otherwise healthy. It is one of the frequent cause of pain and bleeding per rectum and cause considerable patient discomfort and disability.

A number of pharmacological sphincter relaxants have been introduced and claimed to show good results but surgical treatment is frequently needed. In our study 50 patients admitted with chronic anal fissure and operated during the study period. They were followed up to 6 months. During this period, they were followed up to know whether they developed any complications and recurrence. Complications were recorded and tabulated.

The patients were subjected to a lateral internal sphincterotomy or a lateral internal sphincterotomy with anal advancement flap as per their randomly allotted group. Among the 50 patients 31 underwent lateral sphincterotomy,19 patients underwent lateral sphincterotomy with anal advancement flap.52% were females and 48% were males. Most of the patients (20) fell in the age group between31 to 40 years (40%).

Associated diseases like haemorrhoids are also treated along with the surgery for anal fissure. 10% of cases had associated haemorrhoids.

Urinary retention, usually, the most common complication after such surgeries was seen in 8 patients. This accounted for 16%. However, among those who developed such complication, the majority (5 patients) fell in the lateral sphincterotomy group compared to other group which had only 3 patients. There seemed to increased incidence of urinary retention among the lateral sphincterotomy group. So same data was subjected to a Chi square test, to test the significance of relationship between the incidence of urinary retention and the surgery performed. The test revealed that there was no significant relationship between urinary retention and the operation which was performed.

Mean duration of surgery in cases of lateral internal sphincterotomy was 48.46 minutes, compared to 87.37 minutes in lateral internal sphincterotomy with advancement flap surgeries ,this shows advancement flap surgeries require increased operative time.

Internal sphincterotomy was suggested by Notaras in 1971(62) .Di Billa and Estienne in 1990 suggested that internal sphincterotomy alleviated pain by reduction of sphincter tonicity.

The present study demonstrated that post-operative pain was considerably less in lateral sphincterotomy with advancement flap group and required lesser doses of analgesics, than those who underwent lateral sphincterotomy alone. The mean duration of hospital stay in lateral sphincterotomy group was less (3 days) when compared with lateral sphincterotomy with advancement flap group (7 days). This shows advancement flap surgeries need more inpatient care.

Flap necrosis was noted in one patient who underwent anal advancement flap during the follow up period.

No patients in either group developed anal stenosis or perianal infection.

In our study complete healing was achieved earlier (9 days) in lateral internal sphincterotomy with advancement flap group compared to lateral internal sphincterotomy alone group were healing achieved after 10 days.

Fecal soiling or incontinence was not seen in majority of the study subjects. Out of the 3 subjects having fecal soiling, two belonged to LIS group (66.6%) and the other to Lateral internal sphincterotomy with Advancement flap (33.3%). In the follow up period patients symptomatically improved, and they attained good continence.

No recurrence was reported from either of the two group.

Statistical examinations revealed no significant differences between the two groups in terms of complications. This may be due to smaller sample size. But major differences were noted in terms of post-operative pain relief, duration of surgery, and mean duration of hospital stay and healing rate.

Lateral internal sphincterotomy with advancement flap gives good post-operative pain relief, earlier healing of fissure and patients are more comfortable in their postoperative period. Even though the procedure involves considerable dissection and required increased operative time.

# CONCLUSION

Lateral internal sphincterotomy is standard procedure for patients with chronic anal fissure. Addition of advancement flap with lateral sphincterotomy resulted in

1. Improvement of postoperative pain relief and patient comfort.
2. Postoperative urinary retention was same in both procedure.
3. Postoperative faecal soiling and faecal incontinence was almost equal in both the groups.
4. There was no increase in rate of recurrence during the six months follow up period
5. Advancement flap increase the duration of surgery and hospital stay.
6. Earlier and quicker healing of fissure noted in advancement flap.
7. Duration of hospital stay was more in the advancement flap

Adding advancement flap with lateral sphincterotomy in patients with chronic anal fissure results in good postoperative pain relief and more patient comfort and early wound healing of the fissure.

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# PROFORMA

| | |
|---|---|
| **Personal Details:** | |
| **Name :** | **Age/Sex:** |
| **Address:** | |
| **Educational status:** | **Occupation** |
| **IP.No:** | **Date of Admission:** |
| **Ward:** | **Date of Discharge:** |
| **Chief Complaints:** | |
| **History of present illness:** | Duration |
| Past history | |
| Previous anal surgery<br>Hypertension<br>Diabetes Mellitus<br>Tuberculosis<br>Bronchial Asthma | |
| Personal History<br>Diet<br>Smoking<br>Alcoholism<br>Menstrual history (in women) | |

| | |
|---|---|
| **Family history** –<br>No. of children and their condition (for women) | |
| **General Examination:**<br>a) Built<br>b) Anemia<br>c) Edema feet<br>d) Any other deficiency disease<br>e) Overall look – Healthy , Fair, III health | |
| **Local Examination:** | |
| **Systemic Examination:**<br>**CNS**<br>**CVS**<br>**RS**<br>**P/A** | |
| **Proctoscopic Examination:** | |
| **Clinical Diagnosis:** | |
| **INVESTIGATIONS**<br>Routine blood investigations –<br>ECG –<br>CXR – | |

| | |
|---|---|
| USG Abdomen and Pelvis | |
| **Anaesthesia:** | |
| **Type of surgery:**<br>**Lateral internal sphicterotomy**<br>**Lateral internal sphincterotomy with V-Y analadvancement flap** | |
| **Follow Up:** | |

# CONSENT FORM

I am **Dr. BALAMURUGAN .P**, carrying out a study on the topic **"COMPARATIVE STUDY OF LATERAL INTERNAL SPHICTEROTOMY AND LATERAL INTERNAL SPHINCTEROTOMY WITH V-Y ADVANCEMENT FLAP IN TREATMENT OF CHRONIC ANAL FISSURE".**

My research project is being carried out under the Department of General Surgery, Coimbatore Medical College and Hospital, Coimbatore.

**RESEARCH BEING DONE:**

"**COMPARATIVE STUDY OF LATERAL INTERNAL SPHICTEROTOMY AND LATERAL INTERNAL SPHINCTEROTOMY WITH V-Y ADVANCEMENT FLAP IN TREATMENT OF CHRONIC ANAL FISSURE"**

**SAMPLE SIZE:**

50 patients.

**STUDY PARTICIPANTS:**

Patient approaching the out patients department as well is the IP departments of Coimbatore Medical College and Hospital, Coimbatore during the period of August 2014 to July 2015.

**LOCATION:**

Coimbatore Medical College and Hospital, Coimbatore.

You, Shri./ Smt./ Kum. _____, aged ____ years, S/o / D/o / W/o _____, residing at _____ _____ are requested to be a participant in the research study **titled "COMPARATIVE STUDY OF LATERAL INTERNAL SPHICTEROTOMY AND LATERAL INTERNAL SPHINCTEROTOMY WITH V-Y ADVANCEMENT FLAP IN TREATMENT OF CHRONIC ANAL FISSURE"** in Government Medical College Hospital, Coimbatore. You satisfy eligibility criteria as per the inclusion criteria. You can ask any question or seek any clarifications on the study that you may have before agreeing to participate.

**DECLINE FROM PARTICIPATION**

You are hereby made aware that participation in this study is purely voluntary and honorary and that you have the option and the right to decline from participation in the study.

**PRIVACY AND CONFIDENTIALITY**

You are hereby assured about your privacy. Privacy of subject will be respected and any information about you or provided by you during the study will be kept strictly confidential.

## AUTHORIZATION TO PUBLISH RESULTS

Results of the study may be published for scientific purposes and/or presented to scientific groups, however you will not be identified; neither will your privacy be breached.

## STATEMENT OF CONSENT

I, _____, do hereby volunteer and consent to participate in this study being conducted by **Dr. BALAMURUGAN .P**. I have read and understood the consent form / or it has been read and explained to me in my own language. The study has been fully explained to me, and I may ask questions at any time.

Signature / Left Thumb Impression of the Volunteer Date:

Place:

Signature and Name of witness Date:

Place:

Signature of the investigator:

Name of the investigator:

## ஒப்புதல் படிவம்

பெயர் :

பாலினம் :

முகவரி : வயது :

அரசு கோவை மருத்துவக் கல்லூரியில், பொது அறுவை சிகிச்சை துறையில், பட்ட மேற்படிப்பு பயிலும் மாணவர் **பெ. பாலமுருகன்** அவர்கள் மேற்கொள்ளும் **"COMPARATIVE STUDY OF LATERAL INTERNAL SPHICTEROTOMY AND LATERAL INTERNAL SPHINCTEROTOMY WITH V-Y ADVANCEMENT FLAP IN TREATMENT OF CHRONIC ANAL FISSURE"** என்ற சோதனையின் செய்முறை மற்றும் அனைத்து விபரங்களையும் கேட்டுக்கொண்டதுடன், எனது அனைத்து சந்தேகங்களையும் தெளிவுப்படுத்திக்கொண்டேன் என்பதை தெரிவித்துக் கொள்கிறேன்.

நான் இந்த ஆய்வில் முழு சம்மதத்துடனும், சுய சிந்தனையுடனும் கலந்து கொள்ள சம்மதிக்கிறேன்.

இந்த ஆய்வில் என்னுடைய அனைத்து விபரங்களும் பாதுகாக்கப்படுவதுடன், இதன் முடிவுகள் ஆய்விதழில் வெளியிடப்படுவதில் எனக்கு எந்த ஆட்சேபனையும் இல்லை என்பதை தெரிவித்துக் கொள்கிறேன். எந்த நேரத்திலும் இந்த ஆய்வில் இருந்து விலகிக்கொள்ள எனக்கு உரிமை உண்டு என்பதையும் அறிவேன்.

**இடம்** :

**தேதி** : **கையொப்பம் / ரேகை**

# MASTER CHART

| S NO | NAME | AGE | SEX | SURGICAL UNIT | DATE OF SURGERY | ASSOCIATED CONDITION | PROCEDURE DONE | DURATION OF SURGERY(min) | URINARY RETENTION | INCONTINENCE / FECAL SOILING | TIME RELIEF OF PAIN(Days) | NO OF HOSPITAL STAY(Days) | PERSISTENCE OF BLEEDING | COMPLETE HEALING (EPITHELIZATION) Days | FLAP NECROSIS | ANAL STENOSIS | RECURRENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | DHANALAKSHMI | 29 | F | S3 | 8/19/2014 | NIL | LIS+AD FLAP | 90 | NIL | NIL | 5 | 7 | | 9 | NIL | NIL | NIL |
| 2 | SEKAR | 45 | M | S3 | 10/14/2014 | NIL | LIS+AD FLAP | 90 | NIL | NIL | 4 | 7 | | 9 | NIL | NIL | NIL |
| 3 | PATEL RAJ | 34 | M | S3 | 12/9/2014 | NIL | LIS+AD FLAP | 90 | NIL | NIL | 4 | 6 | | 8 | NIL | NIL | NIL |
| 4 | MOORTHY | 15 | M | S3 | 1/17/2015 | NIL | LIS+AD FLAP | 85 | NIL | NIL | 3 | 6 | | 9 | NIL | NIL | NIL |
| 5 | DHANALAKSHMI | 33 | F | S3 | 3/14/2015 | NIL | LIS+AD FLAP | 80 | YES | NIL | 5 | 7 | YES | 9 | NIL | NIL | NIL |
| 6 | RAGUVARAN | 27 | M | S3 | 4/4/2015 | NIL | LIS+AD FLAP | 90 | NIL | NIL | 4 | 6 | | 10 | NIL | NIL | NIL |
| 7 | SUMATHY | 32 | F | S3 | 4/16/2015 | NIL | LIS+AD FLAP | 65 | NIL | NIL | 4 | 6 | | 7 | NIL | NIL | NIL |
| 8 | BEERSINGH | 40 | M | S3 | 21-Apr | NIL | LIS+AD FLAP | 90 | YES | NIL | 3 | 5 | | 7 | NIL | NIL | NIL |
| 9 | BHUVANESHWARI | 36 | F | S3 | 4/25/2015 | NIL | LIS+AD FLAP | 100 | NIL | NIL | 4 | 6 | YES | 15 | YES | NIL | NIL |
| 10 | PARIMALA | 42 | F | S3 | 4/28/2015 | NIL | LIS+AD FLAP | 110 | NIL | present | 4 | 6 | | 8 | NIL | NIL | NIL |
| 11 | KARUPPAMAL | 35 | F | S3 | 5/2/2015 | NIL | LIS+AD FLAP | 100 | NIL | NIL | 4 | 6 | | 7 | NIL | NIL | NIL |
| 12 | BANU | 40 | F | S3 | 5/13/2015 | NIL | LIS+AD FLAP | 110 | NIL | NIL | 3 | 5 | | 7 | NIL | NIL | NIL |
| 13 | CHELLAPPAN | 45 | M | S3 | 5/22/2015 | NIL | LIS+AD FLAP | 90 | NIL | NIL | 3 | 6 | | 8 | NIL | NIL | NIL |
| 14 | KALAIVAVI | 34 | F | S3 | 6/12/2015 | NIL | LIS+AD FLAP | 80 | NIL | NIL | 4 | 6 | | 7 | NIL | NIL | NIL |
| 15 | ANGAPPAN | 63 | M | S3 | 6/15/2015 | HAEMORRHOIDS | LIS+HAEMOR | 90 | NIL | NIL | 2 | 7 | YES | 9 | NIL | NIL | NIL |
| 16 | ELANGOVAN | 32 | M | S3 | 7/31/2015 | NIL | LIS+AD FLAP | 90 | NIL | NIL | 2 | 6 | | 7 | NIL | NIL | NIL |
| 17 | SARAVANAN | 41 | M | S3 | 9/19/2014 | NIL | LIS+AD FLAP | 60 | NIL | NIL | 2 | 6 | | 7 | NIL | NIL | NIL |
| 18 | RAGUNATHAN | 42 | M | S4 | 10/6/2014 | NIL | LIS+AD FLAP | 60 | NIL | NIL | 2 | 6 | | 7 | NIL | NIL | NIL |
| 19 | PRAVEEN KUMAR | 19 | M | S4 | 9/20/2014 | NIL | LIS+AD FLAP | 90 | NIL | NIL | 3 | 7 | | 8 | NIL | NIL | NIL |
| 20 | THANGADURAI | 29 | M | S4 | 11/22/2014 | NIL | LIS+AD FLAP | 90 | YES | NIL | 7 | 5 | | 8 | NIL | NIL | NIL |
| 21 | PANDIYAMMAL | 40 | F | S1 | 11/7/2014 | NIL | LIS | 60 | NIL | NIL | 6 | 6 | | 16 | NIL | NIL | NIL |
| 22 | PARAMESHWARI | 45 | F | S1 | 11/12/2014 | NIL | LIS | 60 | NIL | NIL | 8 | 5 | | 14 | NIL | NIL | NIL |
| 23 | GANESH BABU | 50 | M | S1 | 11/14/2014 | NIL | LIS | 55 | NIL | present | 9 | 3 | | 15 | NIL | NIL | NIL |
| 24 | SATHISH KUMAR | 24 | M | S1 | 1/21/2015 | NIL | LIS | 45 | NIL | NIL | 7 | 5 | | 18 | NIL | NIL | NIL |
| 25 | PALANAL | 65 | F | S1 | 5/20/2015 | HAEMORRHOIDS | LIS+HAEMOR | 90 | NIL | NIL | 15 | 4 | YES | 21 | NIL | NIL | NIL |

| S NO | NAME | AGE | SEX | SURGICAL UNIT | DATE OF SURGERY | ASSOCIATED CONDITION | PROCEDURE DONE | DURATION OF SURGERY(min) | URINARY RETENTION | INCONTINENCE / FECAL SOILING | TIME RELIEF OF PAIN(Days) | NO OF HOSPITAL STAY(Days) | PERSISTENCE OF BLEEDING | COMPLETE HEALING (EPITHELIZATION) Days | FLAP NECROSIS | ANAL STENOSIS | RECURRENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | RAJENDRAN | 38 | M | S1 | 6/3/2015 | NIL | LIS | 45 | NIL | NIL | 7 | 3 | | 16 | NIL | NIL | NIL |
| 27 | VANITHAMANI | 26 | F | S1 | 6/3/2015 | NIL | LIS | 45 | NIL | NIL | 8 | 5 | | 21 | NIL | NIL | NIL |
| 28 | PERUMAL | 49 | M | S1 | 7/8/2015 | HAEMORRHOIDS | LIS+HAEMOR | 55 | NIL | NIL | 12 | 5 | YES | 20 | NIL | NIL | NIL |
| 29 | DEVI | 30 | F | S1 | 10/15/2014 | NIL | LIS | 45 | NIL | NIL | 9 | 5 | | 15 | NIL | NIL | NIL |
| 30 | PAPATHY | 42 | F | S1 | 5/21/2015 | NIL | LIS | 30 | NIL | NIL | 7 | 4 | YES | 15 | NIL | NIL | NIL |
| 31 | MOHANA | 35 | F | S6 | 1/13/2015 | NIL | LIS | 70 | YES | NIL | 15 | 4 | | 15 | NIL | NIL | NIL |
| 32 | KAVITHA | 35 | F | S6 | 1/22/2015 | NIL | LIS | 50 | YES | NIL | 8 | 5 | | 16 | NIL | NIL | NIL |
| 33 | SENTHIL KUMAR | 44 | M | S6 | 2/17/2015 | HAEMORRHOIDS | LIS+HAEMOR | 70 | NIL | NIL | 16 | 5 | | 21 | NIL | NIL | NIL |
| 34 | ANANTHAN | 35 | M | S6 | 8/2/2015 | NIL | LIS | 45 | NIL | NIL | 3 | 3 | | 18 | NIL | NIL | NIL |
| 35 | BOOPATHY | 32 | M | S5 | 3/24/2015 | NIL | LIS | 45 | NIL | NIL | 9 | 5 | | 21 | NIL | NIL | NIL |
| 36 | SHARMILA | 31 | F | S5 | 4/2/2015 | NIL | LIS | 40 | NIL | NIL | 8 | 4 | | 21 | NIL | NIL | NIL |
| 37 | POOMANI | 41 | F | S5 | 5/5/2015 | NIL | LIS | 30 | NIL | NIL | 7 | 4 | YES | 18 | NIL | NIL | NIL |
| 38 | JEGALAKSHMI | 30 | F | S5 | 6/8/2015 | NIL | LIS | 45 | NIL | NIL | 6 | 3 | | 17 | NIL | NIL | NIL |
| 39 | KANGAMANI | 40 | F | S5 | 7/12/2015 | NIL | LIS | 60 | YES | NIL | 8 | 3 | | 18 | NIL | NIL | NIL |
| 40 | THANGAMANI | 22 | F | S5 | 10/12/2014 | NIL | LIS | 60 | NIL | NIL | 8 | 3 | | 20 | NIL | NIL | NIL |
| 41 | SOWMINI | 36 | F | S5 | 3/21/2015 | NIL | LIS | 45 | NIL | NIL | 7 | 4 | | 20 | NIL | NIL | NIL |
| 42 | RAMASAMY | 82 | M | S2 | 10/16/2014 | NIL | LIS | 50 | NIL | present | 5 | 4 | YES | 20 | NIL | NIL | NIL |
| 43 | AMUDHA | 24 | F | S2 | 10/30/2014 | NIL | LIS | 60 | YES | NIL | 5 | 5 | | 14 | NIL | NIL | NIL |
| 44 | KARTHIKEYAN | 24 | M | S2 | 11/13/2014 | NIL | LIS | 70 | YES | NIL | 7 | 5 | | 15 | NIL | NIL | NIL |
| 45 | MAHENDRAN | 45 | M | S2 | 11/22/2014 | NIL | LIS | 60 | NIL | NIL | 8 | 5 | YES | 14 | NIL | NIL | NIL |
| 46 | ARIFA | 27 | F | S2 | 12/8/2014 | NIL | LIS | 27 | NIL | NIL | 9 | 4 | | 16 | NIL | NIL | NIL |
| 47 | LAKSHMANAN | 45 | M | S2 | 4/6/2015 | NIL | LIS | 45 | NIL | NIL | 8 | 4 | | 16 | NIL | NIL | NIL |
| 48 | VELUSAMY | 38 | M | S2 | 7/2/2015 | NIL | LIS | 38 | NIL | NIL | 8 | 3 | | 18 | NIL | NIL | NIL |
| 49 | PAPATHY | 47 | F | S2 | 5/21/2015 | HAEMORRHOIDS | LIS+HAEMOR | 47 | NIL | NIL | 6 | 4 | YES | 21 | NIL | NIL | NIL |
| 50 | PANDISELVI | 35 | F | S2 | 4/17/2015 | NIL | LIS | 35 | NIL | NIL | 6 | 5 | | 18 | NIL | NIL | NIL |

| | |
|---|---|
| LIS | LATERAL INTERNAL SPHINCTEROTOMY |
| AD FLAP | ADVANCEMENT FLAP |
| HAEMOR | HAEMORRHOIDECTOMOY |